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Vol 44. Ser. A. Part 4. pp. 101-136. APRIL, 1956.

THE REVIEW OF APPLIED ENTOMOLOGY

SERIES A: AGRICULTURAL

ISSUED BY THE COMMONWEALTH INSTITUTE OF ENTOMOLOGY.

C·A·B

LONDON:
COMMONWEALTH INSTITUTE OF ENTOMOLOGY,
56, QUEEN'S GATE, S.W.7.

KURIR (A.). **Ein neuer Holzschädling für Mitteleuropa, der amerikanische Splintholzkäfer (*Lyctus planicollis* Lec.).** [A new Timber Pest for Central Europe, the American Sapwood Beetle (*L. planicollis*).]—*Anz. Schädlingsk.* **27** pt. 6 pp. 81–86, 6 figs., 15 refs. Berlin, 1954.

Hickory wood imported into Austria from the United States in 1950–51 for the manufacture of sports goods, and semi-finished articles made from it, were found in 1953 to be infested by *Lyctus planicollis* Lec. This beetle has not previously been recorded in Central Europe, although it was earlier introduced into England and from there into Finland [*cf. R.A.E.*, A **37** 446]; it has recently been observed in Guatemala [**43** 191]. A list is given of other deciduous, mainly hard, woods that are attacked by this Lyctid, and its bionomics are reviewed from the literature and from observations on the Austrian material. All stages are described. In the laboratory at 14–25°C. [57·2–77°F.] and 30–55 per cent. relative humidity, emergence continued from 14th March to 8th September in 1953, with two peaks in May, and began on 5th January in 1954. Eggs were laid, generally in masses of 3–4, in surface crevices of the sapwood, the younger wood being preferred because of its larger pores. Individual females laid a total of 30–50 eggs each, and the larvae hatched 2–3 weeks later and tunnelled into the wood. Development was uninterrupted in the laboratory, but the larvae hibernate in the field. Pupation occurs just below the surface of the wood. The pupal stage lasted 2–3 weeks, and the newly emerged adults remained in their circular exit holes for some days or weeks. The length of life of the adults was 10–35 days. The only parasite reared from *L. planicollis* was the Braconid, *Monolexis fuscicornis* Först. Preventive measures against infestation are prolonged storing of the wood in dry, airy premises, and coating with varnishes or paint. In control experiments, exposure to damp heat at 65°C. [149°F.] was fatal to all stages, the minimum effective duration of treatment being one hour at a wood thickness of up to 16 mm., and satisfactory results were also obtained by dipping in various proprietary wood preservatives. Other beetles found in the infested wood in small numbers comprised *Lyctus* (*Trogoxylon*) sp. and *Bostrychus* sp.

STEINHAUSEN (W.). **Der Apfelschalenwickler, *Capua reticulana* Hb., ein neuer Obstschädling.** [The Summer Fruit Tortricid, *Adoxophyes orana* (Fisch. v. Roesl.), a new Pest of Fruit Trees.]—*Anz. Schädlingsk.* **27** pt. 6 pp. 86–87, 9 refs. Berlin, 1954.

Since 1952, *Adoxophyes orana* (Fisch. v. Roesl.) (*Capua reticulana* (Hb.)) has caused considerable damage to the leaves and fruits of apple in several areas in Germany, including Berlin. The bionomics of this Tortricid are reviewed, and suggestions for control are made. In Germany, adults of the overwintering generation emerge from mid-May and those of the summer generation from mid-July, these dates being somewhat earlier than those recorded in England [*cf. R.A.E.*, A **41** 303]. Infestation was reported to have increased in one case after the application of a fungicide spray, possibly because of mortality of natural enemies and the increased attractiveness to the moths of the sprayed leaves.

HEINZE (K.). ***Hyalopterus amygdali* Blanch., die Mehlige Pfirsichblattlaus, als Schädling am Pfirsich.** [*H. amygdali*, the Mealy Peach Aphis, as a Pest of Peach.]—*Anz. Schädlingsk.* **27** pt. 8 pp. 119–120, 4 figs., 2 refs. Berlin, 1954.

Peach trees at Dahlem, near Berlin, have of late years been severely injured by *Hyalopterus amygdali* (Blanch.), an Aphid that has only recently

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been distinguished from the mealy plum aphis, for which the author uses the name *H. pruni* (Geoffr.).* Characters differentiating the winged and wingless parthenogenetic females and the sexual forms of the two species are given. The attack on peach was particularly severe in 1951, when the trees were heavily infested in July. The resulting loss of sap led to serious leaf-drop by the middle of the month, and the remaining leaves and the fruits were covered with sooty mould. Some of the trees were less affected than others and retained most of their leaves. Infestation remained heavy in August, the Aphids being most numerous on the younger leaves at the tips of the shoots, and almost all the fruits dropped without ripening. Fresh leaves appeared in mid-August and were heavily infested. As a result, the young twigs became very susceptible to frost damage. The mild autumn of 1953 provided favourable conditions for the sexual forms of the Aphid, and numerous winter eggs were laid on the wood. Infestation was therefore expected to be as severe in 1954 as it had been in 1951.

KELLER (E.). **Erfahrungen mit der chemischen Maikäferbekämpfung in der Schweiz.** [Experience in the chemical Control of Cockchafers in Switzerland.]—*Anz. Schädlingsk.* **27** pt. 10 pp. 147–152, 4 figs., 39 refs. Berlin, 1954.

The author refers briefly to the institution in 1950 of a centre for the distribution of information on cockchafer control in Switzerland, reviews from the literature the numerous large-scale spraying operations with BHC carried out in that country against the adults of *Melolontha melolontha* (L.) (*vulgaris* F.) in 1948–54, following favourable preliminary experiments [*R.A.E.*, A **39** 419], and gives data to illustrate the satisfactory results obtained by the treatment of woodland edges, etc. The use of dusts for this purpose has not become established, owing to their short residual action and the risk of drift to plants in blossom, which would endanger bees. DDT has been little used because of its repellent effect on the beetles [*cf.* **37** 117–118], and γ BHC is now used instead of crude BHC, to avoid tainting crops adjoining treated areas. It is applied at the rate of about 7–8 oz. per acre, and retains its stomach toxicity for 7–12 days after spraying. Suspension sprays are applied from ground apparatus, and emulsified solutions from aircraft. The use of helicopters was introduced in 1950, mainly for the treatment of inaccessible forest areas. They gave good results at costs about equal to those for spraying from the ground, but ground apparatus is preferred for forest edges because of its greater accuracy. The results of observations to determine the flight direction of the beetles [**42** 354] and the most effective timing of treatment [**40** 188] have been successfully applied. When emergence from the soil continued for over three weeks in 1951, and when it took place in one area in 1952 before the leaves were sufficiently developed, additional and preliminary sprays, respectively, at half the normal strength gave satisfactory control. On the whole, there were no harmful effects on bees, fishes, birds or domestic animals when the sprays were applied with due care, though in one area where trees were sprayed in blossom considerable damage was caused to bees. Mist spraying by night with ground apparatus equipped with searchlights is widely practised in order to safeguard bees and to utilise the favourable thermal

* The name *H.* (*Aphis*) *pruni* (Geoffr., 1762) is now commonly used instead of *H.* (*A.*) *arundinis* (F., 1775) for the mealy plum aphis because of doubt concerning the identity of *A. arundinis* F., which was described from a plant that is not one of the known alternative food-plants of the plum aphis. A proposal to validate the name *A. pruni* Geoffr. and its designation as the type of *Hyalopterus* has been submitted to the International Commission on Zoological Nomenclature [*Bull. zool. Nomencl.* **9** (1954) pt. 6 pp. 163–165].—*Ed.*

conditions of the night air. Sampling for larvae in meadowland showed that the reductions in the population due to the treatments averaged 73 per cent. and that there was 90 per cent. reduction in the areas showing more than 20 larvae per sq. metre.

GAUSS (R.). **Gemeine Strahlenmücke, *Philia febrilis* L., als Buchenkeimlingstöter.** [*Dilophus* (*Philia*) *febrilis* destroying Beech Seedlings.]—*Anz. Schädlingsk.* **27** pt. 10 pp. 152–154, 4 figs., 6 refs. Berlin, 1954.

In April 1954, beech seedlings in a forest nursery in Württemberg were found to have been damaged in the region of the cotyledons by larvae of *Dilophus* (*Philia*) *febrilis* (L.), which were observed close to the soil surface when the covering of moss that had protected the seedlings during the winter was removed. As the eggs of this Bibionid are generally laid in compost or manure [*cf. R.A.E.*, A **29** 526], it is assumed that overwintering larvae were introduced into the seed bed when compost was hoed into it in the preceding autumn, before sowing. The larvae were killed by drenching with oil, and no further damage was reported. Preventive measures suggested include treating compost or manure with calcium cyanamide before use and the spreading of straw, which is subsequently burnt, over the seed beds to attract the females in search of oviposition sites. The bionomics of *D. febrilis* [*cf. loc. cit.*] are summarised, and the damage caused by Bibionid larvae in general is briefly reviewed and considered to be outweighed by their beneficial effect on the soil.

WEIDNER (H.). ***Tinea vastella* Zeller, ein Schädling an Jagdtrophäen in Afrika.** [*T. vastella*, a Pest of Hunting Trophies in Africa.]—*Anz. Schädlingsk.* **27** pt. 10 pp. 154–156, 2 figs., 6 refs. Berlin, 1954.

The horns of hunting trophies collected locally were severely infested in Angola by *Tinea vastella* (Zell.). The larva, pupa and adult of this moth are described, measures for its control are reviewed from the literature [*cf. R.A.E.*, A **27** 295], and it is stated that protection was obtained by cleaning the horns and rubbing them with a proprietary preparation containing arsenic. Infestation was heaviest in the lowlands and secondary forest. Adults were observed in September–October and early May, at the beginning and end of the rainy season, respectively. They probably survive the dry season, larval development taking place during the rains.

WIESMANN (R.). **Recherches sur le contrôle de vol de la cochylis (*Clysia ambiguella* Hb.).**—*Rev. Zool. agric.* **54** no. 1–3 pp. 1–19, 11 figs., 22 refs. Talence, 1955.

The use of modern insecticides for the control of *Clysiana* (*Clysia*) *ambiguella* (Hb.) on vines requires accurate timing of applications for success. Observations on adult flight by means of baits have long been made in Switzerland, but the catches are dependent on weather and most of the females taken have already oviposited. In view of the failure of attempts to develop an improved bait [*R.A.E.*, A **35** 144], other methods of timing control measures were investigated. The eggs are extremely difficult to detect in the field, and sufficient pupae for rearing could not easily be obtained by collecting from the vines or by surrounding the stems with bands of corrugated cardboard to attract larvae seeking pupation sites [*cf.* **27** 458]. Attention was therefore devoted to obtaining them from nearly full-fed larvae. These were collected in the field, segregated into the

two sexes, and provided with young vine leaves on which to complete their feeding. First-generation larvae were provided with small rolls of corrugated cardboard in which to pupate and those of the second (overwintering) generation were allowed to pupate on pieces of vine stems in glass containers. A small platform about a foot above the soil was erected among the vines, and the pupae exposed on it, the rolls containing those of the first generation being placed in small wire-mesh cages and inspected daily from early July, and the vine stems bearing those of the second generation being transferred to wire-mesh cylinders and exposed in mid-April. Trap-jars were placed among the vines, and the numbers of males and females taken in them daily and the numbers that emerged in the cylinders and cages in 1940–41 are shown on graphs and discussed. Adults appeared in the latter 3–6 days before any were taken in the trap-jars, and maximum numbers were observed 3–5 days earlier. Changes in weather did not affect emergences in the cylinders and cages, which therefore gave more regular results than the trap-jars, and it is concluded that emergence can be more accurately timed by this method than by relying on bait catches. The latter are of value in estimating the intensity of infestation, however, and a combination of the two is recommended.

DUSSEL (J.). **Essais de traitements par nébulisation insecticide dans la lutte contre le carpocapse des pommes et des poires.**—*Rev. Zool. agric.* **54** no. 1–3 pp. 29–34, 1 graph, 2 refs. Talence, 1955.

In further tests on the control of *Cydia pomonella* (L.) on apple and pear near Bordeaux [*cf. R.A.E.*, A **43** 370], a spray product containing 30 per cent. trichlorocamphane was applied at 0·15 per cent. active ingredient and a parathion emulsion concentrate was diluted to contain 0·15 per cent. parathion and applied as a conventional spray or to 0·0225 per cent. parathion and applied as a mist spray (droplet diameter about 30 μ). Four applications were made between 28th May and 3rd August, and fallen fruits were collected from early July. The apples were picked in early September and the pears in October, and the results, which are given in tables, showed that trichlorocamphane was ineffective, that the conventional parathion spray gave good control and that the mist spray was inferior to it, especially on apple, the trees being too tall for proper treatment of the tops. There was considerable infestation of pears late in the season by *Cydia* (*Laspeyresia*) *molesta* (Busck).

THERMES (R.) & CESSAC (M.). *Cnephasia wahlbomiana* **L., une tordeuse observée en 1953 sur les artichauts dans le Roussillon.**—*Rev. Zool. agric.* **54** no. 1–3 pp. 35–37. Talence, 1955.

In early April 1953, larvae of *Cnephasia virgaureana* (Treitschke) (*wahlbomiana*, auct.) were found webbing the young involucral bracts of globe artichokes [*Cynara*] in Roussillon and later penetrating the inflorescences, causing losses of up to 40 per cent. of the heads in some fields. In tests on control, sprays in emulsion form were applied directly to the inflorescences on 8th April, a fortnight before the artichokes were picked, and the percentage of heads attacked was reduced by 14th April from 39 for no treatment to 24 by 1·4 lb. chlordane, 19 by 0·4 lb. rotenone, 5 by 0·36 lb. lindane [almost pure γ BHC], and 3 by 0·6 lb. DDT, all per 100 gals., and to 7 by 2 per cent. summer-oil emulsion. The rotenone, lindane and summer-oil sprays caused scorching, and DDT is therefore recommended; it had no effect on flavour.

Benassy (C.) & Burgerjon (A.). **Méthode d'élevage au laboratoire de *Prospaltella perniciosi* Tow.**—*Ann. Epiphyt.* **6** no. 1 pp. 5–10, 4 figs., 2 refs. Paris, 1955.

Prospaltella perniciosi Tower was introduced into France for release against *Quadraspidiotus perniciosus* (Comst.), and descriptions are given of two types of cages that were devised for breeding laboratory colonies. Both are of transparent plastic material on a wooden or fibreboard base. One is a horizontal cage capable of holding 2–3 watermelons infested by the Coccid, as in the method used in the United States [*cf. R.A.E.* A **32** 371], and the other is a vertical cage that encloses the stems of 2–3 other food-plants of the Coccid, such as apple, pear or blackcurrant, planted in pots. The latter are useful as the watermelons are readily attacked by *Colletotrichum lagenarium* and rendered unusable.

Benassy (C.). **Remarques sur deux aphelinidés: *Aphytis mytilaspidis* Le Baron et *Aphytis proclia* Walker.**—*Ann. Epiphyt.* **6** no. 1 pp. 11–17, 8 figs., 8 refs. Paris, 1955.

Characters are given differentiating the full-fed larvae and pupae of *Aphytis proclia* (Wlk.) and *A. mytilaspidis* (LeB.), which are the most important parasites of *Quadraspidiotus perniciosus* (Comst.) near Lyons, the first being much the more numerous [*cf. R.A.E.*, A **43** 27]. *A. proclia* also parasitises *Pseudaulacaspis pentagona* (Targ.) in the district, and *A. mytilaspidis* this and other Coccids. Larvae of *A. proclia* were observed not only to parasitise the adult females of *Q. perniciosus* but also to feed on the eggs beneath the dried-up Coccids. *A. mytilaspidis* does not apparently have this habit, but some evidence was found that it inhibits the oviposition of *Lepidosaphes ulmi* (L.). Observations are recorded indicating that *A. proclia* has two generations a year and sometimes a partial third, though individuals of the latter seldom reach the overwintering stage.

Couturier (A.) & Robert (P.). **Recherches sur le comportement du hanneton commun (*Melolontha melolontha* L.) au cours de sa vie aérienne.**—*Ann. Epiphyt.* **6** no. 1 pp. 19–60, 16 figs., 62 refs. Paris, 1955.

The authors describe observations, mainly in eastern France, on the sequence of flights made by adults of *Melolontha melolontha* (L.) for maturation feeding and oviposition and the effects of local topography, weather and other conditions on them, and compare the results with those recorded in the literature [*cf. R.A.E.*, A **42** 354; **43** 26, etc.]. The overwintered adults in the soil did not become active at soil temperatures below 10°C. [50°F.]. Under favourable conditions, emergence from the soil, which began between 11th April and 3rd May in the different areas investigated, was completed in about ten days, but it continued for over three weeks when they were unfavourable. Observations in the laboratory on adults caged with maple shoots over soil showed that the numbers of days required by the females for the development of the first batch of eggs, and (in brackets) the second batch, were 19–56 (23–33), averaging 30·6 (29), at 15°C. [59°F.], 15–31 (11–14), averaging 19·7 (12·1), at 20°C. [68°F.], 13–37 (6–9), averaging 23·4 (7·7), at 25°C. [77°F.], and 12–21 (5–8), averaging 15·2 (6·6), at 27°C. [80·6°F.]. There was thus a much greater variation in the development of the first than of the second batch of eggs. At all four temperatures, 80 per cent. of the females laid at least one batch of eggs; at 15°C., 30 per cent. laid a second batch, and at 20, 25 and 27°C., 50 per cent. did so and some even laid a third. The numbers of eggs

averaged 19·6, 19·6, 18·5 and 15·1 at the four temperatures, respectively, for the first batch and 12, 15·2, 17·8 and 13 for the second. The females survived for 36–88, 9–54, 10–43 and 7–37 days at 15, 20, 25 and 27°C., respectively, after leaving the soil, with averages of 59·5, 40·5, 32 and 26·1. Field observations showed that 4°C. [39·2°F.] was about the minimum temperature at which flights occurred towards the forest and 10°C. about the minimum necessary for oviposition flights. The behaviour of the adults flying to sites for maturation feeding was similar to that recorded by Schneider [**42** 354]. When leaving the forest edges for oviposition, the females followed routes that led them most directly away from all masses of trees.

A detailed account is given of tests in 1953 near Colmar in which smoke screens some 16–26 ft. high, 65–100 ft. wide and over half a mile long were released at wind speeds of about 3–4 miles an hour, across the line of flight of adults flying to and from the forest edge. Adults returning to the forest either changed direction so as to reach the trees at a point where they were not obscured by the smoke, or flew straight to the screen, followed it along its length until the forest was again visible, and then turned sharply towards the nearest trees. Females leaving the trees to oviposit flew up to the smoke and then over it, maintaining their original direction, though they sometimes passed through it if it was not too dense. Those that flew over it descended to ground level again in a gradual curve, so that few eggs would be laid immediately behind such a barrier.

Reali (G.) & Rota (P.). **Prima serie di esperimenti effettuati in Italia con un preparato a base di *p*.clorobenzil-*p*.clorofenil solfuro contro il ragno rosso.** [A first Series of Experiments carried out in Italy with a Product containing p-Chlorobenzyl p-Chlorophenyl Sulphide for the Control of the Red Spider.]—*Boll. Zool. agr. Bachic.* **20** fasc. 3 pp. 175–192, 5 graphs, 1 ref. Milan, 1954. (With Summaries in French and English.)

The authors review the properties of Chlorparacide (p-chlorobenzyl p-chlorophenyl sulphide) [*cf. R.A.E.*, A **42** 67] and give an account of tests in Lombardy in 1954 in which it was used for the first time in Italy, for the control of *Metatetranychus ulmi* (Koch) (*Paratetranychus pilosus* (C. & F.)) on apple and pear. It is particularly effective against the eggs and young stages of this mite, but has little effect on the adults [*cf. loc. cit.*].

In the first test, Chlorparacide was applied on 12th June at 0·2 lb. per 100 gals. water in a wettable-powder spray and at 0·012 per cent. in an emulsion spray to apple and pear trees that also received normal treatments against insects and fungi. Infestation was severe on some of the trees, though adults were rare. On 16th June, very few nymphs and a few adults were found on the trees treated with Chlorparacide, in spite of rain, and none of the eggs hatched on treated leaves kept under observation in the laboratory. Infestation developed normally on the control trees, which received the insecticidal and fungicidal sprays only, and when samples from them were taken to the laboratory on 24th June, all the eggs hatched; 60 per cent. of the eggs on leaves taken from trees treated with Chlorparacide hatched, but all the nymphs died. In view of the severity of the attack on the control trees, these were treated on 24th June with a proprietary parathion spray. Infestation had decreased on all the trees by 4th July and was especially low on those treated with Chlorparacide. On 15th July, one variety of pear was severely attacked, the numbers of nymphs and adults per leaf averaging 30–40 on the control trees and 8–12 on those treated with Chlorparacide, and it was further found that eggs were hatching

normally on all the trees. The Chlorparacide treatments were therefore applied again on 15th July to half the numbers of trees that received them originally. Of the few eggs present on 19th July, only those from trees treated once with Chlorparacide or with parathion hatched. On 27th July, infestation was tolerable on the trees treated once with Chlorparacide, extremely low on those treated twice, and severe on one variety of pear and one of apple treated with parathion. In view of this, all the control trees were treated with parathion at 0·2 per cent. on 30th July and infestation on them diminished rapidly, though it remained higher than that on trees treated twice with Chlorparacide. The numbers of mites on trees sprayed once with Chlorparacide began to increase on 4th August, 53 days after treatment.

In the second test, 30 severely infested apple trees were sprayed on 17th June, and ten of them again on 3rd July, with 0·2 lb. wettable Chlorparacide per 100 gals. water, and both these and the control trees received sprays of lead arsenate and bordeaux mixture against *Cydia pomonella* (L.) and fungi. Counts of mites were made at about weekly intervals, on leaves from the most heavily infested parts of the trees. By 29th June, infestation was reduced to a satisfactory level, and by 8th July it was negligible on the treated trees, though it developed normally on the controls. The single application of Chlorparacide kept the mites in check for about 60 days (until 23rd August), and two applications afforded almost complete control until early August and prevented serious increase until the end of that month. On 23rd August, 15 of the trees treated once, on 17th June, received a second treatment with Chlorparacide. The infestation was satisfactorily controlled and did not increase again for a period of 40 days (until 4th October). Since infestation is more difficult to control in late summer, it is desirable that populations should not be allowed to increase then, and it is thought that if this second application had been made about 20th July, it would have kept the mite in check for the remainder of the season.

Large numbers of trees in the rest of the orchard were sprayed with Chlorparacide on 3rd July and 24th August, and by 4th October only a few adults and living eggs could be found on them. The addition of calcium arsenate or bordeaux mixture to the Chlorparacide sprays did not affect their efficacy. Outstanding results were given on trees sprayed on 23rd August with a mixture of Chlorparacide, against the eggs and young mites, and Aramite [2-chloroethyl 2(p-tert.butylphenoxy)-1-methylethyl sulphite], which is effective against the adults, all stages being extremely rare from 6th September to 4th October.

All the trees treated with Chlorparacide remained green and no phytotoxic effects were observed on them or on vegetable crops or vines growing beneath them. Owing to the improved condition of the treated apple trees, attack by fungi was much reduced.

REALI (G.). **Esperimenti di lotta contro insetti dannosi mediante prodotti a base di canfene clorurato.** [Experiments on the Control of injurious Insects with Toxaphene.]—*Boll. Zool. agr. Bachic.* **20** fasc. 3 pp. 193–201, 2 refs. Milan, 1954.

Further tests were carried out in northern Italy in 1953 on the use of toxaphene for the control of injurious insects [*cf. R.A.E.*, A **43** 202]. An emulsion spray containing 0·25 per cent. toxaphene, applied on 3rd and 18th July to peas, beans and cucurbits severely infested by Aphids, completely freed them from infestation by 25th July, and the same spray was also effective against larvae of *Arge ochropa* (Gmel.) (*rosae*, auct.) on rose bushes, preventing reinfestation for 30 days. A similar spray of 0·5 per

cent. toxaphene controlled the larvae of *Croesus* sp. on poplar. When emulsion sprays containing 0·25 and 0·15 per cent. toxaphene were applied on 2nd August to apple trees infested by *Stephanitis* (*Tingis*) *pyri* (F.), the mortality percentages for the nymphs and (in brackets) the adults on 11th August were 100 (90) and 91·5 (78), respectively, as compared with 4 (11·5) for no treatment. The sprays were applied again on 11th August, and the mortality percentages on 19th August were 100 (100) and 100 (93), respectively, as compared with 3 (17). The lower concentration was applied a third time on 20th August and gave complete mortality by 28th August. When 0·2 per cent. toxaphene in a wettable-powder spray was applied on 20th September to crucifers heavily infested by *Pieris napi* (L.) and *Mamestra brassicae* (L.), the crop was completely freed from the larvae within a few days and many dead examples were found on the ground. The same spray applied on 8th and 23rd July to young tobacco plants severely infested by larvae of *Agrotis segetum* (Schiff.) and *Laphygma exigua* (Hb.) gave complete control by 29th July, with no tainting of the tobacco.

Stored wheat naturally or artificially infested with *Calandra granaria* (L.) and *Plodia interpunctella* (Hb.) was treated with 0·1 and 0·05 per cent. (by weight) of a dust containing 20 per cent. toxaphene in talc and kept at 18–20°C. [64·4–68°F.] and a relative humidity of 75–80 per cent. At the higher concentration, 80 and 100 per cent. of the *Calandra* adults and the *Plodia* larvae, respectively, died in 20 hours, and the living *Calandra* adults all died in ten hours when removed from the treated grain. At the lower concentration, mortality was complete in 60 and 48 hours for the two species, respectively. Adults of *Calandra* and larvae of *Plodia* all died within 48–60 hours when placed in the wheat 50 days after it had been treated, and there was no reduction in germinating power of the grain. When wheat seeds treated with toxaphene and a fungicidal dust were sown on 11th September in soil severely infested by *Gryllotalpa gryllotalpa* (L.), the percentages that had germinated by 19th September were 85 and 95 for 0·34 and 1 per cent. toxaphene, respectively, from a 20 per cent. dust, and 75 and 85 for 0·68 and 2 per cent. toxaphene, respectively, from a 40 per cent. dust, as compared with 60 for the fungicide alone. The addition of 4 per cent. Thanite to the 2 per cent. toxaphene treatment increased the germination percentage to 95. On 26th September, it was found that the mole-crickets had migrated to the plants not treated with toxaphene, and about 50 per cent. of these were destroyed, as compared with only about 5 per cent. for those treated with toxaphene at the two lower concentrations and none for the remainder. By 11th October, almost all the plants had been destroyed in the control plot, whereas the others showed good stands.

In laboratory tests, fifth-instar larvae of *Bombyx mori* (L.) and adults of *Melasoma aeneum* (L.) fed only slightly on leaves of mulberry and alder, respectively, that had been sprayed with 0·2 per cent. wettable toxaphene and allowed to dry, but they showed signs of intoxication within 12 hours and all died within about 48 and 72 hours, respectively, when removed to untreated leaves.

Novitzky (S.). **Sinonimia e distribuzione geografica di** *Signiphorina subaenea* **Först (Hym., Chalc., Thysanidae), iperparassita dei coccidi** (*Pseudococcus* **sp.).** [The Synonymy and Distribution of *Thysanus subaeneus*, a Hyperparasite of Mealybugs.]—*Boll. Zool. agr. Bachic.* **20** fasc. 3 pp. 203–212, 1 pl., 19 refs. Milan, 1954.

The author discusses the generic classification of the Signiphorids. He does not agree with the view that the scope of *Thysanus* should be extended

to include them all [*R.A.E.*, A **42** 45], though he considers that the establishment of a complete generic classification is not possible at present. The genera that he considers valid include *Signiphorina*, an Italian translation of the original characterisation of which [**42** 39] is appended. He concludes from a comparison of the original descriptions and figures of *T.* (*S.*) *malus* (Nikol'skaya) [**42** 39] with the types of *T.* (*S.*) *subaeneus* (Först.) that the former is a synonym of the latter. Examination of specimens of the hyperparasite of *Planococcus* (*Pseudococcus*) *citri* (Risso) in Italy originally considered by G. Domenichini to be *T. elongatus* (Gir.) [**42** 340], showed that these are also *T. subaeneus*. *T. elongatus* is a distinct species known only from the United States. A dark-winged female of *T. subaeneus* originating from northern Poland is held to represent a new variety, and the name *thorunensis*, var. n., is proposed for it.

Grandori (R.) & Rota (P.). **Nuove esperienze di lotta contro la piralide del mais nel 1954.** [New Experiments on the Control of *Pyrausta nubilalis* in 1954.]—*Boll. Zool. agr. Bachic.* **20** fasc. 3 pp. 213–224, 1 map, 3 refs. Milan, 1954.

Experiments on the control of *Pyrausta nubilalis* (Hb.) on maize in Lombardy [*cf. R.A.E.*, A **44** 42] were continued in 1954, when infestation was somewhat lower than usual. Two districts were selected for experiment. One of them contained some 740 acres of maize, and it was divided into two areas. In the first of these, the maize stalks from the previous year were passed through special chopping machines during the winter of 1953–54, used for cattle bedding, removed to manure heaps and ultimately ploughed into the soil [*cf. loc. cit.*]. The stalks in the other area were used as bedding without being chopped, and they were placed on the manure heaps in layers 8–10 ins. deep, each successive layer being treated with calcium cyanamide at the rate of about 2·4 oz. per sq. yard, washed in with water or cattle urine. All field refuse likely to harbour the Pyralid was destroyed in the first half of April. Hybrid maize was sown in spring, and counts were made from mid-September of the plants attacked in the two areas and in the fields surrounding them, in which no organised control measures had been undertaken. The percentages of plants infested were 46, 56 and 66, respectively, and the numbers of larvae per stalk averaged 0·77, 0·87 and 1·14. The infestation was lowest in a few fields in the first area in which the maize stalks had also been chopped in the previous year.

In the other district, sprays containing dieldrin and DDT were applied at rates of 0·45 and 0·9 lb. toxicant per acre, respectively, to a field of first-crop hybrid maize on 18th June against the first generation of *P. nubilalis*, and the same insecticides were applied at the same rates as dusts against the second generation by means of a Buffalo turbine machine that was driven along lanes left about every 55 ft. and gave better coverage of the mature plants than could be obtained with sprays [*cf.* **44** 43]. At harvest, in mid-September, the yields of grain in lb. per acre were 5,305 and 5,378 for dieldrin and DDT, respectively, as compared with 5,103 for no treatment, and the average numbers of larvae per stalk were 0·61, 0·53 and 0·89. It is concluded that chemical treatment offers no significant advantage when infestation is low.

Fuller (R. A.), Riegert (P. W.) & Spinks (J. W. T.). **Persistence of Radio-activity in Grasshoppers (Acrididae) tagged with Phosphorus-32.** —*Canad. Ent.* **86** no. 5 pp. 201–203, 1 graph, 2 refs. Ottawa, 1954.

Riegert (P. W.), Fuller (R. A.) & Putnam (L. G.). **Studies on Dispersal of Grasshoppers (Acrididae) tagged with Phosphorus-32.**—*T. c.* pp. 223–232, 2 figs., 12 refs.

The following is almost entirely the authors' summary of the first paper. Nymphs of *Camnula pellucida* (Scudd.), allowed to feed in the first instar for 24 hours on wheat seedlings sprayed with an aqueous solution containing ^{32}P in the form of phosphate ion, retained sufficient radioactivity for it to be readily detected with a portable Geiger counter throughout their development. Loss of radioactivity through excretion was very great at first, but decreased steadily and almost ceased 14 days after treatment. Loss of radioactivity through moulting was negligible. The survival of treated grasshoppers was as high as that of untreated ones.

The following is largely the authors' summary of the second paper. When released on bare, cultivated fields in Saskatchewan, second-, third-, fourth- and fifth-instar nymphs of *C. pellucida* and fifth-instar nymphs and adults of *Melanoplus mexicanus mexicanus* (Sauss.) that had been rendered radioactive by the method described in the first paper showed no ability to orient themselves and move towards a food supply. Second-instar nymphs of *C. pellucida* moved up to 90 yards in eight days, dispersing over 1·8 acres and moving at an average rate of 0·4–1·8 yards per hour, or 0·9–4·3 yards for every hour during which the temperature at the surface of the soil reached or exceeded 70°F. (70°F.-hour). A mixed population of third-, fourth- and fifth-instar nymphs dispersed at an average rate of 2·8–5 yards per hour, or 6·6–12 yards per 70°F.-hour. A mixed population of fifth-instar nymphs and adults of *M. m. mexicanus* moved up to 240 yards in six days, dispersing over 4·4 acres and moving at an average rate of 1·7–2·4 yards per hour, or 5·3–7·5 yards per 70°F.-hour. The early-stage nymphs and the adults moved with the wind; later-stage nymphs moved against it. Winds greater than 10 miles per hour tended to suppress activity and dispersal by keeping the grasshoppers under shelter. Overcrowded populations (15,000–30,000 per 4–8 sq. ft.) dispersed 2–9 times as fast as those under uncrowded conditions. This was apparently due to increased activity caused by optical responses. Seven days after release, nymphs and adults of *M. m. mexicanus* had not been recorded more than 300 yards from the release site; 60 per cent. of the population was within 50 yards of the release point, 30 per cent. had moved 51–100 yards, and only 10 per cent. had travelled more than 100 yards. Recovery of radioactive grasshoppers one week after release indicated that about 96 per cent. of the population had disappeared, probably because of death due to starvation and predators.

The radioactive isotope ^{32}P was shown to be a useful tag for field studies of grasshopper movement and dispersal over a relatively short period. About 15,000–20,000 individuals were conveniently tagged at a time by feeding on wheat seedlings, growing on an area of 4 sq. ft., that had been sprayed with 50 cc. solution containing 0·5 mc. ^{32}P. About 14 per cent. of the applied radioactivity was taken up and retained by the grasshoppers.

Green (G. W.). **Some Laboratory Investigations of the Light Reactions of the Larvae of *Neodiprion americanus banksianae* Roh. and *N. lecontei* (Fitch) (Hymenoptera: Diprionidae).**—*Canad. Ent.* **86** no. 5 pp. 207–222, 8 figs., 2 refs. Ottawa, 1954. **Humidity Reactions and Water Balance of Larvae of *Neodiprion americanus banksianae* Roh. and *N. lecontei* (Fitch) (Hymenoptera: Diprionidae).**—*T.c.* no. 6 pp. 261–274, 9 graphs, 15 refs.

The investigations recorded in these two papers were carried out with larvae of *Neodiprion banksianae* Rohw. and *N. lecontei* (Fitch) originating

from jack pine (*Pinus banksiana*) and red pine (*P. resinosa*), respectively, in Ontario, and the methods and apparatus employed are described in detail.

The following is virtually the author's summary of the first paper. First-, second- and third-instar larvae of *N. banksianae* that have fed are, on the whole, indifferent to discrete (point-source) light at room temperatures. When starved for six hours, they become strongly photopositive. Fully fed fourth- and fifth-instar larvae are positive to discrete light at room temperatures. The effect of short-term starvation on these later stages is evident in the more circuitous paths they follow in their positive response to a point source. First-instar larvae of *N. lecontei* are indifferent to discrete light when fully fed, and starvation for six hours results in a strongly photopositive response. All other instars are positive to discrete light at room temperatures when fully fed, but some differences appear after starvation. Short-term starvation does not change the sign of the reaction of second- and third-instar larvae, but produces both a greater degree of indifference and some compass reactions to light in the last three instars. Larvae of *N. lecontei* infected with polyhedral virus disease become increasingly less positive to point-source light as the disease becomes established. This increasing indifference is comparable to the effects of short-term starvation of healthy larvae. Starvation of late-stage larvae of *N. lecontei* for 24 hours results in increased indifference and some compass reaction to point-source light. Starvation for 72 hours results in a reversion to strongly photopositive behaviour. First- and second-instar larvae of *N. banksianae* that have fed become photonegative to diffuse light between 37·2 and 37·3°C. [98·96 and 99·14°F.]. Third-, fourth- and fifth-instar larvae become photonegative between 35·5 and 36·4°C. [95·9 and 97·52°F.]. When starved for six hours, larvae of *N. banksianae* in the second and subsequent instars become photonegative to diffuse light at lower temperatures than when fully fed. This decrease in reversal temperature is significantly different in the third, fourth and fifth instars. Fully fed first- and second-instar larvae of *N. lecontei* become photonegative to diffuse light between 43·7 and 44·1°C. [110·66 and 111·38°F.]. All other instars become photonegative between 40·7 and 41·4°C. [105·26 and 106·52°F.].

The following is virtually the author's summary of the second paper. Larvae of *N. banksianae* and *N. lecontei* react to gradients of evaporation rate by aggregating at evaporation rates as high as 0·195 cu. mm. per minute, with indications that sixth-instar larvae of *N. lecontei*, at least, would show a preference near 0·24 cu. mm. per minute if this rate had been presented to them in gradient form. Aggregations in an illuminated gradient are produced primarily by a klinokinetic mechanism. Larvae of both species demonstrate a strong dry reaction upon initial exposure to paired humidity-choices within an olfactometer at 28°C. [82·4°F.]. It has been shown that distributions that appear to be static at first become quite dynamic as exposure is prolonged, and that, in time, a decided wet reaction occurs. Aggregations in chambers where paired humidity-choices are presented are produced orthokinetically. The preference for regions of high evaporation rates, as indicated by laboratory experiments, is reflected in the distribution of both species on their food-plants, and also in the selection of these on the basis of their exposure. Both species are normally found in the most exposed sites on the food-plant, and there is evidence that open-grown trees along the borders of stands are the most susceptible to attack, especially by larvae of *N. lecontei*. There is evidence to suggest that some tracheal control over the rate of water loss occurs in larvae of *N. banksianae* when they are starved in dry air. Although weight losses due to the evaporation of body water from these larvae are greatest when they are

exposed to dry air, the rate of water loss becomes the same in dry and in moist air after ten hours of exposure. Fifth-instar larvae of *N. lecontei* begin to lose body water at a much more rapid rate in dry air at temperatures near 40°C. [104°F.]. This temperature corresponds closely to the mean light-reversal temperature of this instar.

PERRON (J. P.). *Spalangia rugosicollis* **Ashm. (Hymenoptera: Chalcidoidae), a new Parasite of the Onion Maggot,** *Hylemya antiqua* **(Mg.) (Diptera: Anthomyiidae).**—*Canad. Ent.* **86** no. 5 p. 222. Ottawa, 1954.

In early September 1953, 41 of 370 first-generation pupae of the onion maggot, *Hylemyia antiqua* (Mg.), collected from large field rearing cages in Quebec were parasitised by *Spalangia rugosicollis* Ashm. Only one parasite developed in each pupa, and only the first generation was attacked. This is the first record of this Pteromalid from *H. antiqua*.

STACE-SMITH (R.). **Chlorotic Spotting of Black Raspberry induced by the Feeding of** *Amphorophora rubitoxica* **Knowlton.**—*Canad. Ent.* **86** no. 5 pp. 232–235, 1 fig., 1 ref. Ottawa, 1954.

KNOWLTON (G. F.). **A new Black Raspberry Aphid.**—*T. c.* pp. 235–236.

The first of these papers contains an account of investigations on the aetiology of chlorotic spots observed on the leaves of black raspberry (*Rubus occidentalis*) in coastal regions of British Columbia. They were found to be associated with feeding by an Aphid described from winged and wingless viviparae taken on wild Pacific blackberry (*R. vitifolius*) as *Amphorophora rubitoxica*, sp.n., in the second paper, which also contains characters distinguishing it from related species. The spots continue to appear from June to August, and virtually all the plants are affected to varying degrees by mid-July. In laboratory tests, the feeding positions of Aphids placed singly on black-raspberry leaves and left for four hours were recorded. Spots developed within a week on most of the feeding sites; none appeared in other positions or after more than a week, and it was concluded that the condition was caused by the injection of a toxin into the plant by the feeding Aphids. Further evidence supporting the view that a virus was not involved was provided when young Aphids newly deposited by viviparous females and caged on healthy black-raspberry seedlings caused the spots to develop, since no virus is known to be transmitted hereditarily by Aphids.

The chlorotic spots, which are described, developed within four days and were usually on the main or secondary veins of the leaves; on young foliage, growth was arrested and the leaves became distorted. Several spots commonly coalesced and in some cases the veinlets became chlorotic. In a special test, the symptoms usually developed after a feeding period of one hour, but in one instance feeding for 15 minutes was sufficient. Seedlings of red raspberry (*R. idaeus*) and Himalaya blackberry (*R. procerus*) were not affected by the feeding of *A. rubitoxica*, but some seedlings of *R. vitifolius* developed very pale spots.

A. rubi (Kalt.), the adults of which are indistinguishable from those of *A. rubitoxica* in the field, also occurs commonly on cultivated black raspberry in British Columbia, but its feeding does not induce visible symptoms. All of 27 collections of Aphids from *R. vitifolius* made during the summer of 1953 consisted of *A. rubitoxica*, and all of 20 from red raspberry comprised *A. rubi*, whereas of 16 from black raspberry, 11 consisted of *A. rubi* and five of *A. rubitoxica*. In tests, each of 20 colonies of *A. rubi*, and none of 48 of *A. rubitoxica*, transmitted the leaf-mottle and yellow-mosaic virus diseases of raspberry.

Baird (R. B.). **A Species of** *Cephalosporium* **(Moniliaceae) causing a fungous Disease in Larvae of the European Corn Borer,** *Pyrausta nubilalis* **(Hbn.) (Lepidoptera: Pyraustidae).**—*Canad. Ent.* **86** no. 5 pp. 237–240, 5 figs., 2 refs. Ottawa, 1954.

The following is largely the author's summary. A species of *Cephalosporium* was isolated as the cause of the death of a collection of full-fed larvae of *Pyrausta nubilalis* (Hb.) kept in cold storage in Ontario during the summer of 1951. The symptoms caused are described. In tests, larvae were readily infected by contact with growing cultures of the fungus, or by injection of at least 5,000 spores suspended in 0·01 ml. distilled water per larva. There was no extensive mycelial growth at the time of death of the larvae infected by either method.

Munroe (E.). **The eastern North American Subspecies of the Barberry Geometrid (Lepidoptera).**—*Canad. Ent.* **86** no. 6 pp. 282–283, 4 figs., 1 ref. Ottawa, 1954.

MacKay (M. R.). **The Egg and Larva of** *Coryphista meadi atlantica* **Munroe (Lepidoptera: Geometridae).**—*T. c.* pp. 284–288, 25 figs., 1 ref.

In the first of these papers, *Coryphista meadii atlantica*, n., is described as the eastern subspecies of the barberry Geometrid [*cf. R.A.E.*, A **30** 185] and is recorded from New Jersey, Pennsylvania, Ontario and Nova Scotia. It occurs in two forms and an outbreak of it caused minor damage to ornamental barberry near Ottawa in 1952. The western subspecies (typical *meadii* (Pack.)), which also has two forms, occurs regularly and commonly in southern British Columbia and the Cordilleran region of Alberta. The second paper contains descriptions of the egg and four larval instars of *C. m. atlantica*. The eggs hatch a few days after being laid, and the larval stage lasts about 2½ weeks.

Wellington (W. G.). **Atmospheric Circulation Processes and Insect Ecology.**—*Canad. Ent.* **86** no. 7 pp. 312–333, 9 figs., 41 refs. Ottawa, 1954.

The author gives a general account of the origin and movements of air masses and frontal systems, with particular reference to the main types of air masses that affect the weather and climate of North America, and illustrates the effects of the passage of cold fronts or their associated instability lines on insect activity by reference to the occurrence of mass flights of the spruce budworm [*Choristoneura fumiferana* (Clem.)] in Ontario [*R.A.E.*, A **40** 300] and to variations found by J. B. Lewis in the daily numbers of insects caught in a rotating net, and the effect of air-mass climatology on insect mortality by observations on the lodgepole needle-miner [*Recurvaria* sp.] in the Bow Valley of Alberta [**43** 304]. He also shows how the annual fluctuations in numbers of pressure centres and the shifts that occur in their tracks influence the numbers of centres passing through a restricted area, and these in turn are related to some observed trends in insect populations, outbreaks of the forest tent caterpillar [*Malacosoma disstria* Hb.] in Alberta, Saskatchewan and Manitoba being associated with the increasingly frequent occurrence of southern or south-western cyclonic centres [*cf.* **40** 380] and increases in populations of *C. fumiferana* in northern New Brunswick with absence of cyclonic centres [**39** 151]. The need for considering indirect as well as direct effects of climate on insect populations [*cf.* **42** 338] and for studying climate during the period before

an outbreak is emphasised, and it is suggested that consideration of the effects of atmospheric circulation on population changes can produce more reliable results than attempts to correlate them directly with fluctuations in sunspots or ultraviolet radiation.

AVIDOV (Z.), MOHRER (I.) & HARPAZ (I.). **Control of Olive Fly with Dieldrin and Methoxychlor in Israel.**—*FAO Plant Prot. Bull.* **3** no. 10 pp. 145–147. Rome, 1955.

Experiments on the control of *Dacus oleae* (Gmel.) on olive in Israel with sprays of wettable dieldrin and methoxy-DDT (methoxychlor), with a wetting agent, were continued in 1953 and 1954 in the grove in which 0·5 per cent. of these materials had reduced the percentage infestation to 1·4 and 4 in 1952 [*R.A.E.*, A **43** 205]. Two applications were again made, timed as before, and the olives were picked green at the end of August. In 1953, the percentages of fruits infested were 8·5 and 7·1 for 0·5 and 0·2 per cent. methoxy-DDT and 0·2 and 5·8 for 0·5 and 0·2 per cent. dieldrin, as compared with 38·1 for no treatment, and in 1954 they were 5·4, 4·3 and 7·8 for 0·5, 0·2 and 0·1 per cent. methoxy-DDT and 1·5, 2·3 and 4·1 for the same concentrations of dieldrin, respectively, as compared with 13·5. The results obtained in 1954 are analysed statistically, and though infestation was lower than usual owing to very hot weather in July–August, both materials are shown to have given significant control, with no significant differences between concentrations. Analysis of sprayed olives showed that the dieldrin residues in or on the fruits in no case exceeded 0·5 part per million.

MILLER (P. R.). **Plant Disease Situation in the United States.**—*FAO Plant Prot. Bull.* **3** no. 10 pp. 148–151, 2 figs. Rome, 1955.

It is stated in the course of this paper that a few individuals of *Aceria tulipae* (Keifer), the Eriophyid that transmits wheat streak mosaic [*cf. R.A.E.*, A **43** 352, etc.], were taken in Riley County, Kansas, in June and July 1954 on slides coated with silicone grease that had been mounted in a frame with a wind vane and exposed about 150 ft. above the ground. During the period of exposure, the wind was mostly from the south, and the nearest wheat fields in that direction were some 1½–2 miles distant. There was a widespread outbreak of wheat streak mosaic in Kansas in 1954, but Riley County was not one of the most heavily infected areas.

In view of the close association of *Hylastes* (*Hylastinus*) *obscurus* (Marsham) with diseased red-clover plants, tests were made in Maryland to discover whether the insect was responsible for disseminating pathogenic organisms. In 1947, adults were allowed to crawl for ten minutes over sporulating cultures of *Colletotrichum trifolii* (southern anthracnose fungus), and were then transferred to pots containing red-clover plants. The pots were kept at about 60–70°F. for three weeks, when all the test plants, except one, showed typical symptoms of anthracnose. Control plants infested with uncontaminated insects did not become infected. Negative results were obtained from a similar test begun a week later, but the prevailing high temperature and low relative humidity were unfavourable for the development of the fungus. The tests were continued in April 1952 with *C. trifolii* and *Kabatiella caulivora* (northern anthracnose fungus). After one month, eight of the 24 test plants infested with fungus-carrying beetles had been entered by individuals carrying *K. caulivora* and six by those carrying *C. trifolii*. Two of the former plants developed symptoms of

northern anthracnose; no positive symptoms of southern anthracnose were observed, and the control plants remained healthy. The low humidity in the greenhouse during the tests may have accounted for the somewhat inconsistent results obtained.

Barnes (O. L.). **Effect of Food Plants on the Lesser Migratory Grasshopper.**—*J. econ. Ent.* **48** no. 2 pp. 119–124, 2 figs., 11 refs. Menasha, Wis., 1955.

Melanoplus mexicanus mexicanus (Sauss.) is common in lucerne fields in southern Arizona, but lucerne itself has been shown to be an unfavourable food for it [*R.A.E.*, A **37** 36]. Investigations were therefore carried out in 1953 on the effect of lucerne and various weeds that commonly occur in the fields on the survival, development, morphology and fecundity of this grasshopper. The following is based on the author's summary of the results. In small-scale tests in which nymphs were reared on single plant species, survival to the adult stage was best on hedge mustard (*Sisymbrium irio*), followed in order by nettle-leaf goosefoot (*Chenopodium murale*), Johnson grass [*Sorghum halepense*] and lucerne, and growth was most rapid on *Sisymbrium*, followed by Johnson grass, *Chenopodium* and lucerne. No nymphs developed beyond the first instar on Bermuda grass (*Cynodon dactylon*). Both survival and rate of growth were slightly greater on a mixed diet of all the plants than on *Sisymbrium* alone. In large-scale tests, the percentage survival of the nymphs and, in brackets, the average length of the nymphal stage in days were 41 (34) on *Sisymbrium*, 40 (36) on Johnson grass, 8 (50) on lucerne and 53 (30) on the mixed plants. *Sisymbrium* was the preferred food, followed by lucerne, Johnson grass, *Chenopodium* and *Cynodon*.

The adults lived for 71–92 days, surviving longest on *Sisymbrium*, followed by lucerne, Johnson grass and *Chenopodium*, and depositing averages of 196, 13, 89 and 43 eggs, respectively, when fed on these and 221 when on a mixed diet. The average body dimensions and dimension ratios were progressively smaller on *Sisymbrium*, mixed plants, Johnson grass, *Chenopodium* and lucerne, and were most typical of the solitary phase on lucerne and most divergent from it [*cf.* **37** 35] on *Sisymbrium*.

Since lucerne is apparently a much less suitable diet for the grasshopper than the weeds, it is concluded that weed control might reduce populations in lucerne fields, particularly in large lucerne-growing areas when long-distance migrations are not involved.

Sinclair (W. B.) & Lindgren (D. L.). **Vapor Heat Sterilization of California *Citrus* and Avocado Fruits against Fruit-fly Insects.**—*J. econ. Ent.* **48** no. 2 pp. 133–138, 1 graph, 2 refs. Menasha, Wis., 1955.

The quarantine measures that would be enforced in California if *Dacus dorsalis* Hend. became established there [*cf. R.A.E.*, A **38** 316] include the vapour-heat treatment of susceptible fruits and vegetables before they leave infested areas. Many of the fruits grown in California and liable to infestation could be treated in this way, but there was doubt as to how far *Citrus* and avocados would tolerate vapour heat. Two treatments approved for fruits to be exported from Hawaii [*cf.* **41** 13, etc.] were therefore tested. In one, the fruits were exposed to saturated vapour, and the temperature was gradually raised over a period of 4–8 hours until it reached 110°F. at the centre of the fruit and was then maintained at that level for another 8¾ hours; in the other, which is more rapid, the fruits were exposed to

saturated vapour at 120°F. and removed when the internal temperature reached 119°F.

The avocados tested were damaged by either treatment and failed to ripen normally, but the tolerance of the *Citrus* fruits varied with the environment in which they were grown, their maturity and their quality. Navel oranges were severely injured, the peel of those from some districts being too tender to withstand either temperature, and the time for which they could be stored was significantly reduced. Surface injury to lemons was not quite so great, but treated fruits deteriorated in store and could not withstand ordinary room temperatures on the packing-house floor; the breakdown was so great as to preclude processing for by-products. Valencia oranges withstood the treatments better, but those picked late in the season were sometimes severely damaged. The flavour was slightly affected, but there was not the marked surface damage observed on navel oranges. Sound grapefruits were fairly tolerant of treatment at 110°, though there was some injury to the peel, varying with the locality of origin, but they were injured at 120°F.

Chemical analysis showed that the heat treatments caused a marked reduction in the titratable acidity and ascorbic-acid content of navel and Valencia oranges, grapefruits and lemons, the decrease in free acidity being accompanied by a corresponding increase in the pH of the juice. Soluble solids tended to be slightly reduced in treated as compared with untreated fruits, but the difference was significant only in one series of tests with lemons. Flavour was affected in all *Citrus* fruits, particularly in lemons and less in grapefruits and Valencia oranges than in navel oranges.

Elmore (J. C.). **The Nature of *Lygus* Bug Injury to Lima Beans.**—*J. econ. Ent.* **48** no. 2 pp. 148–151, 5 figs., 16 refs. Menasha, Wis., 1955.

The author describes the feeding mechanism of *Lygus* bugs and records observations in 1951–54 on the damage caused by them to lima beans in southern California, where *L. hesperus* Knight was found to be the commoner species on this crop and *L. elisus* Van D. only occasionally present on it. The observations showed that the bugs oviposit in and feed on the main stems while the plants are small and on the tender growth terminals as they develop. Stems, fruiting spikes and young pods are all attacked, but not the flowers or flower buds. However, extensive feeding and oviposition cause shedding of buds and young pods, with consequent crop loss, and distortion of those pods that survive. Although the bugs prefer to feed on the tenderest parts of the plants, they also attack pods in the mature green stage and puncture or pit the beans within. A scarcity of small tender pods tends to increase the pitting of beans within the larger pods. The pods become resistant to attack either during or immediately after the mature green stage.

Hopkins (L.), Abu Yaman (I. K.) & Carruth (L. A.). **Flavor Evaluation and Residue Analysis of Malathion-treated Lettuce.**—*J. econ. Ent.* **48** no. 2 pp. 151–152, 3 refs. Menasha, Wis., 1955.

In tests in Arizona in 1954, malathion was applied in sprays at 2 U.S. pints 57 per cent. emulsion concentrate per acre in 10 U.S. gals. water from aeroplanes and in 70 U.S. gals. from ground equipment, and 5 per cent. dusts at about 35 lb. per acre from both, to lettuces of which the heads were well formed. Samples taken for chemical analysis immediately

and 3, 7 and 10 days after aeroplane applications showed malathion residues of 68·1, 4·1, 2·4 and 0 parts per million for the spray and 65, 1·6, 0·5 and 0 p.p.m. for the dust, and samples taken immediately and three days after ground applications showed 125 and 0 p.p.m. after spraying and 85 and 0 after dusting. Flavour evaluation tests made 3, 7 and 12 days after treatment showed no measurable tainting, and it is concluded that malathion is probably safe for application to an edible crop such as lettuce almost up to harvest.

Sullivan (W. N.), Hornstein (I.), Yeomans (A. H.) & Tsao (Ching-hsi). **Improved Deposits for controlling Insects outdoors.**—*J. econ. Ent.* **48** no. 2 pp. 153–155, 6 refs. Menasha, Wis., 1955.

In further investigations on the application of insecticides to give non-penetrating and persistent deposits on outdoor foliage [*cf. R.A.E.*, A **43** 51], the efficacy was tested of incorporating a chlorinated terphenyl (Aroclor 5460) with chlorinated-hydrocarbon insecticides and applying the mixture in a low-boiling solvent (methyl ethyl ketone). A non-volatile chlorinated hydrocarbon (DDT) and two volatile ones (aldrin and γ BHC as lindane) at 1 lb. per U.S. gal. methyl ethyl ketone, alone and with 0·125 or 1 lb. Aroclor, were applied as sprays to pine branches, and flies (*Musca domestica* L.) were exposed for 30 minutes to foliage samples brought into the laboratory after various periods.

Aldrin and γ BHC alone vaporised so rapidly that the deposits killed hardly any flies after ten days, whereas the mixtures with the higher proportion of Aroclor killed 100 and 99 per cent. after 102 days and those with the lower proportion killed 93 and 96 per cent. after 30 days. DDT gave high kills for 30 days alone or with the lower concentration of Aroclor, but had begun to lose its effect after only 3–4 days with the higher one. The advantages of the ketone were shown in further tests in which DDT was applied to pine and spruce as a solution in it, as a 5 per cent. solution in fuel oil and as an emulsified solution. Percentage kills for the ketone solution and (in brackets) oil solution on pine were 96–100 (37–48) after 15–39 days and 90 (0) after 78. On spruce, they were 96 (1), 92 (3) and 92 (1) after 3–4, 30 and 78 days. Deposits from the emulsified solution were nearly as effective and quite as lasting on pine as those from the ketone solution, but less effective and much less lasting on spruce. Dispersal experiments with concentrated solutions of 3·5 lb. of a mixture of DDT and γ BHC (4:1) with 3·5 lb. Aroclor or of 4 lb. DDT with 4 lb. Aroclor in 1 U.S. gal. methyl ethyl ketone applied from a mist blower showed that evaporation of a small amount of the solvent from the spray droplets left semisolid spheres about 100 μ in diameter that dispersed well and adhered tenaciously, without penetrating the surface on which they landed.

Frost (S. W.). **Response of Insects to ultra violet Lights.**—*J. econ. Ent.* **48** no. 2 pp. 155–156, 1 fig. Menasha, Wis., 1955.

In further investigations in Pennsylvania on the response of insects to ultraviolet light [*cf. R.A.E.*, A **43** 43, etc.], traps hung 6 ft. above the ground were operated for 64 nights from 29th May to 13th August 1954 from 8.30 or 9 p.m. to 4.30 or 5 a.m., depending on the intensity of the daylight. The 100-watt mercury-vapour lamp with the red-purple filter [**41** 370], another 100-watt lamp emitting much stronger rays between 2,800 and 3,800 ångströms, to which a red-purple filter was fitted, and two 2½-watt ultraviolet lamps used together in a single trap caught totals of

69,443, 62,888 and 3,156 insects, indicating that the second lamp, with the stronger rays, had no particular advantage over the first. The first lamp was notably more attractive than the second to Lepidoptera and Trichoptera and rather more attractive to Diptera, Coleoptera and Homoptera.

Henderson (C. F.) & Tilton (E. W.). **Tests with Acaricides against the Brown Wheat Mite.**—*J. econ. Ent.* **48** no. 2 pp. 157–161, 3 refs. Menasha, Wis., 1955.

The following is based on the authors' introduction and summary. *Petrobia latens* (Müller), which has been recorded as injurious to wheat in Oklahoma [*R.A.E.*, A **40** 116] and Utah [**40** 179], was widespread on this crop in Kansas and part of Oklahoma in 1952 and also in part of Colorado in 1953. In experiments in south-western Kansas in the spring and autumn of 1952 and the spring of 1953, 18 organic toxicants were tested in emulsion sprays for its control. The sprays were applied at the rate of 8 U.S. gals. per acre with a jeep sprayer equipped with a 20-foot boom and nozzles 20 ins. apart, and counts were made before treatment and about five days and two weeks after it. The results are given in detail and indicated that demeton [diethyl 2-(ethylmercapto)ethyl thiophosphate] and parathion at 0·5 lb. per acre were the most effective. Compound 923 (2,4-dichlorophenyl benzenesulphonate) and Ovotran [p-chlorophenyl p-chlorobenzenesulphonate] appeared to act slowly, but the former showed no appreciable residual effect when mixed with parathion. Chlorinated hydrocarbons, including DDT and BHC, had little effect. Flat and cone-type nozzles were about equally effective when 0·5 lb. parathion was applied per acre.

Hopkins (L.). **Biology and Control of *Polistes exclamans* Viereck in Arizona *Citrus* Groves.**—*J. econ. Ent.* **48** no. 2 pp. 161–163. Menasha, Wis., 1955.

Polistes exclamans Vier. has in recent years become increasingly abundant in *Citrus* groves in central Arizona, and the refusal of labourers to work in infested groves, owing to the extremely painful stings of these wasps, has sometimes resulted in the loss of 20 per cent. of the crop. Tests were therefore made in 1953 to find a cheap insecticide spray that would give rapid knockdown and control. The number of nests per tree ranges up to 26, almost all on the east side, facing towards the trunk, so that general dusting or spraying of the trees does not eliminate the wasps. The over-wintered queens begin constructing the nests at the beginning of March, and the number of wasps per nest varies from less than 100 to over to 200. They attack in numbers if the nest is disturbed, but not otherwise.

In the tests, 12 formulations were applied to the nests with a hand compression sprayer. Solutions of 1 or 3 per cent. Thanite in deodorised kerosene were the cheapest and gave immediate knockdown and complete kill of flying adults within three hours; the lower concentration did not injure the trees, but the higher one caused severe and rapid injury to foliage, fruits and small twigs. Since the brood in an abandoned nest dies in 10–14 days from lack of care, the effect of the insecticides on any but brood in capped cells is of little importance, but it was observed that the oil solutions caused the greatest mortality of both capped and uncapped brood. During the autumn of 1953, 1 per cent. Thanite in deodorised kerosene was widely and successfully used by growers, with no injury to the trees, and activity was not resumed in sprayed nests.

BECKER (W. B.). **Tests with BHC Emulsion Sprays to keep boring Insects out of Pine Logs in Massachusetts.**—*J. econ. Ent.* **48** no. 2 pp. 163–167, 18 refs. Menasha, Wis., 1955.

In the tests described, which were carried out in central Massachusetts intermittently in 1948–53, logs of cordwood size cut from living red or white pines [*Pinus resinosa* and *P. strobus*] during the winter were sprayed once in early spring and exposed to attack by wood-boring beetles until the autumn. The main species that attacked them are classified as round-headed borers, of which *Monochamus* sp. and *Asemum moestum* Hald. injured the wood and were the most important and *Rhagium* (*Stenocorus*) *inquisitor* (L.) (*lineatus* Ol.), *Acanthocinus obsoletus* (Ol.) and species of *Pachyta*, *Leptura* and *Leptostylus* or *Leiopus* were generally found in the outer sapwood or bark; ambrosia beetles, of which the only species was *Gnathotrichus materiarius* (Fitch); bark weevils, of which *Pissodes approximatus* Hopk. was the most abundant and *Hylobius* spp. rare; and bark-beetles, comprising *Ips pini* (Say), *I.* (*Orthotomicus*) *caelatus* Eichh., *I.* (*Pityogenes*) *hopkinsi* (Swaine), *Hylastes* (*Hylurgops*) *pinifex* (Fitch) and *Dendroctonus valens* Lec.

In the tests, emulsified solutions of BHC or lindane [almost pure γ BHC] gave consistently good results in all four test years, 0·2 per cent. γ BHC giving almost complete and 0·4 per cent. complete protection throughout the season when applied thoroughly to all sides of individual logs. A spray containing 0·1–1·2 per cent. γ isomer gave 99–100 per cent. protection in one series of tests, whereas 0·8 or 1·6 per cent. DDT in kerosene or in emulsified solution and 0·8 per cent. toxaphene, DDD or methoxy-DDT (methoxychlor) or 0·4 per cent. chlordane in emulsion sprays were not effective against all four types of borers. Spraying half-cord (4 sq. ft.) stacks carefully with 2 U.S. gals. emulsified solution containing 0·4 per cent. γ BHC also resulted in excellent protection in two seasons; the protection was still good in one season when the concentration was halved.

The 0·4 per cent. γ BHC spray caused no visible injury to living white or red pine, hemlock [*Tsuga*] or various deciduous trees when applied in spring, before new growth appeared, or to needle-leaved evergreens sprayed during the growing season, but 0·1–0·4 per cent. sprays frequently caused leaf injury on broad-leaved deciduous hardwoods.

O'DELL (W. V.). **The Gypsy Moth Outbreak in Michigan.**—*J. econ. Ent.* **48** no. 2 pp. 170–172. Menasha, Wis., 1955.

An account is given of the action taken to control an outbreak of the gipsy moth [*Lymantria dispar* (L.)] that was discovered at Lansing, Michigan, on 19th May 1954. A survey was carried out from 25th May to 5th June along the roads of the surrounding territory for three miles beyond the last evidence of infestation, to delimit the infested area, this survey covering an area of 232 sq. miles, and an emulsion spray containing 1 lb. DDT per U.S. gal. was applied with a mist blower to infested trees not more than a day after they were found. Spraying by aeroplane was begun on 6th June and carried out each morning and evening until 10th June, when over 59,000 U.S. gals. 12 per cent. DDT spray had been applied to trees and shrubs over an area of 86,400 acres. Examination of 5,000 traps set up over 1,600,000 acres in July and August revealed the presence of males in four, all to the west of the sprayed area, and an infestation was found near one of these; extensive spraying was to be carried out in the vicinity of these traps in the spring of 1955, and the trap surveys were to be continued.

Glick (P. A.) & Hollingsworth (J. P.). **Response of Moths of the Pink Bollworm and other Cotton Insects to certain ultraviolet and visible Radiation.**—*J. econ. Ent.* **48** no. 2 pp. 173–177, 2 figs., 2 refs. Menasha, Wis., 1955.

The following is based on the authors' summary. Laboratory tests were carried out at College Station, Texas, in 1955 with 23 sources of light to determine their attractiveness to the adults of *Platyedra* (*Pectinophora*) *gossypiella* (Saund.) and other moths that infest cotton there [*cf. R.A.E.*, A **42** 382]. A mercury-vapour lamp with an ultraviolet transmitting filter and ultraviolet fluorescent lamps with and without an integral filter (ultraviolet-blue) attracted most adults of *Platyedra*; lamps with their principal radiation in the visible portion of the spectrum attracted few moths. There was little difference in the response of males and females to the ultraviolet fluorescent and ultraviolet-blue fluorescent lamps. *Heliothis zea* (Boddie) (*armigera*, auct.), *Laphygma frugiperda* (S. & A.), *Alabama argillacea* (Hb.), *Trichoplusia ni* (Hb.) and *Loxostege similalis* (Gn.) were also very responsive to sources of radiation in and near the ultraviolet range; mercury-vapour lamps, with and without ultraviolet transmitting filters, a spot-type Sunlamp and the ultraviolet fluorescent lamp caused the greatest response. In field tests to determine the optimum number and type of lamps for use in insect-collecting traps, a single 15-watt ultraviolet fluorescent lamp was the most efficient.

Togashi (S.) & Parker (R. L.). **Control of the Two-spotted Spider Mite on Bush Beans.**—*J. econ. Ent.* **48** no. 2 pp. 177–179, 6 refs. Menasha, Wis., 1955.

Tetranychus telarius (L.) (*bimaculatus* Harvey) is injurious to many plants in Kansas, particularly beans, and experiments on its control were carried out during the summer of 1953 on three varieties of bush beans grown in pots and small beds. All materials were tested in wettable powders applied at 2 lb. per 100 U.S. gals. and malathion also in a 57 per cent. emulsion concentrate applied at 3·1 pints per 100 gals. Of the wettable powders, 15 per cent. Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite], 25 per cent. malathion and 50 per cent. Ovotran [p-chlorophenyl p-chlorobenzenesulphonate] applied on 7th August resulted in 99, 14 and 99·9 per cent. reduction in population on 24th August as compared with no treatment. Ovotran had an ovicidal effect, and malathion gave good initial though poor residual kill. Treatment with 25 per cent. malathion on 13th August resulted in 91 per cent. reduction on 22nd August; with EPN-300 [27 per cent. ethyl p-nitrophenyl thionobenzenephosphonate] and 50 per cent. Ovotran on 21st August in 85 and 89 per cent. reduction, respectively, on 30th August; and with 15 per cent. Aramite, 50 per cent. Ovotran and 25 per cent. Chlorobenzilate [ethyl 4,4′-dichlorobenzilate] on 7th September in 94, 98 and 95 per cent. on 16th September. A spray of 25 per cent. Diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl thiophosphate], applied on 8th September, gave quick initial kill, but only 30 per cent. reduction, as compared with no treatment, on 17th September. The malathion emulsion spray, applied on 12th August, gave 88 per cent. control by 22nd August. The three varieties of beans showed no differences in susceptibility to mite infestation. One of them showed a few yellowed leaves after treatment with wettable malathion but no other treatment caused injury, and plants sprayed with Aramite or Ovotran developed more new leaves than those receiving malathion or no treatment.

Davich (T. B.) & Apple (J. W.). **Schradan Content in Field Grown Peas in Relation to Pea Aphid Control.**—*J. econ. Ent.* **48** no. 2 pp. 180–181, 12 refs. Menasha, Wis., 1955.

In an experiment in Wisconsin in 1952, peas sown on 19th May and infested by *Macrosiphum pisum* (Harris) were sprayed with 0·25, 1, 4 or 8 lb. schradan per acre in 50 U.S. gals. water on 26th June and examined for Aphids and analysed for schradan content 2, 9 and 14 days later. The 4- and 8-lb. doses did not differ significantly from each other, giving 98–100 per cent. control on the first two dates, although the schradan contents fell from 109·2 and 266·8 parts per million on the first to 64·2 and 105·4 p.p.m. on the second, and 95·5 and 99·8 per cent. control on the third, when the schradan contents were 9 and 19·8 p.p.m. Treatment with 0·25 and 1 lb. schradan resulted in no significant control in two days, in 28 and 90 per cent. in nine days, at schradan contents of 13·6 and 31·5 p.p.m., and in no significant control and 65·4 per cent., respectively, in 14 days, at schradan contents of 0 and 0·6 p.p.m.

At harvest, 21 days after application, treatment with 4 and 8 lb. schradan per acre resulted in residues of 4·8 and 11·2 p.p.m. in the foliage and 3·2 and 6·5 p.p.m. in the fresh peas; none was found in the pods. The 0·25- and 1-lb. dosages resulted in no residues at harvest, and the second could probably be used effectively if the insecticide were released for use on peas [*cf. R.A.E.*, A **39** 385].

Underhill (G. W.), Turner jr. (E. C.) & Henderson (R. G.). **Control of the Clover Root Curculio on Alfalfa with Notes on Life History and Habits.**—*J. econ. Ent.* **48** no. 2 pp. 184–187, 1 ref. Menasha, Wis., 1955.

Sitona hispidulus (F.) is one of the most injurious insect pests of lucerne in Virginia. The larvae feed on the taproots and secondary roots, reducing the vigour of the plants and causing loss of stand and yield, and the adults, which are present throughout the year, are found chiefly on the soil surface under the plants and feed on the leaves, but cause very little damage. Observations on the bionomics of the weevil [*cf. R.A.E.*, A **18** 478] in 1920 showed that egg deposition reached a peak between 15th and 25th April; the females laid an average of 218 eggs each, and hatching occurred in about three weeks. Injury to the roots is most severe between early March and the end of June and occurs mainly in the top 4 ins. of soil, though it may reach a depth of 10 ins. or more. Observations on root injury during the first and second seasons after sowing showed that the percentages of the plants pushed out of the ground by winter freezing and thawing that had been moderately heavily and lightly damaged were 32 and 54, respectively, during the first season, as compared with 11 and 69 for those not affected by frost, and 71·1 and 28·7, respectively, during the second season, as compared with 20·7 and 76·5, indicating that root injury by *Sitona* increases frost damage by weakening the plant and its root system.

In preliminary tests on control, aldrin, dieldrin, chlordane and lindane [almost pure γ BHC] were applied to the soil at 4, 2, 10 and 1 lb. per acre, respectively, with the fertiliser in August 1950 and worked in to a depth of 3–4 inches, before sowing. Chlordane and aldrin were the most effective and γ BHC the least so in reducing root injury by June 1951, but all gave some control. In more extended tests, in which the insecticides were similarly applied with fertiliser in August 1952 or by hand in a mixture with moist sand to the soil surface in October 1952 or March 1953, aldrin and dieldrin at 2–4 lb. per acre in August or October and chlordane at 5–10 lb.

in October gave good control on first-year lucerne, especially at the higher rates, whereas the same insecticides in March and 5–10 lb. toxaphene in August or October were less effective. Heptachlor, tested at 4–8 lb. per acre in March only, gave good results. Repetition of treatment in certain plots on 20th March 1953 gave some reduction in injury on plants treated in August, but inconclusive results on those treated in October or early March. Treatment of second-year lucerne with aldrin, chlordane or heptachlor on 11th or 24th March gave poor control, and treatment on 1st June none; heptachlor appeared the most effective.

It is concluded that soil insecticides applied in autumn, just before or during the period of adult activity in lucerne fields [*cf. loc. cit.*], kill most of the females before they oviposit, whereas treatment in spring fails to affect many of the larvae, which have already entered the soil and partly escape the effects of surface treatments. There was some indication that spring treatment was more effective if applied early rather than late.

ANDERSON (R. F.). **Internal Medication of Plants for the Control of Insects.** —*J. econ. Ent.* **48** no. 2 pp. 187–190, 9 refs. Menasha, Wis., 1955.

An account is given of greenhouse tests on the systemic action of various chemicals, including the extract (picrasmin) of Jamaican quassia (*Picrasma excelsa*), on arthropods, the materials being mixed with water and applied to the soil round plants in six-inch pots. When leaves from bean plants treated with picrasmin were fed to larvae of *Epilachna varivestis* Muls., 2, 8 and 16 gm. extract per pot resulted in 100, 94 and 15 per cent. mortality of first-, second- and third-instar larvae in a week, respectively, and the results were similar when the larvae fed directly on the treated plants, but much lower mortalities were obtained in a later test, owing possibly to differences in the soil or in the susceptibility of the larvae used. When purified picrasmin was applied at 1–20 mg. per pot, mortalities were high during the first week and high for 10–20 mg. picrasmin during the second week, but leaves that opened after treatment showed little toxicity, which suggests little translocation from older to younger leaves and rapid decomposition in the soil. Picrasmin rendered the leaves bitter within 24 hours of treatment. Food consumption, rate of development and the periods required for 50 per cent. mortality of first-instar larvae all varied inversely with dosage in the range of 0·12–2 gm. extract per pot, so that the effect might have been due to repellency and consequent starvation, but a spray of 5 per cent. extract applied directly to first-instar larvae gave 98 per cent. kill in 48 hours, moribund individuals becoming glued to the leaves by a whitish rectal excretion.

In tests with other arthropods, *Aphis craccivora* Koch (*medicaginis*, auct.), *Schizolachnus* (*Unilachnus*) *parvus* (Wilson), *Brevicoryne brassicae* (L.), *Myzus persicae* (Sulz.) and larvae of *Neodiprion lecontei* (Fitch), *Malacosoma americanum* (F.) and *Clostera* (*Ichthyura*) *inclusa* (Hb.) were all affected by feeding on treated plants, but *Tetranychus telarius* (L.) (*bimaculatus* Harvey), *Macrosiphum solanifolii* (Ashm.) and larvae of *Pieris rapae* (L.) were not.

Parathion similarly applied showed variable results against *E. varivestis*, 10–15 mg. per pot giving complete kill of the larvae in some tests but not in others, and as much as 50 mg. per pot was ineffective against *T. telarius*. In more detailed tests with *Malacosoma americanum* on wild cherry seedlings, 800 mg. per pot gave 85, 100 and 94 per cent. kill of larvae in the first, third and fourth–fifth instars, respectively, in a week, the insects being placed on the plants 7–42 days after treatment, and subsidiary tests indicated that the effect was not due to fumigant action. No kill of *E. varivestis*

was given by eight other chemicals, including BHC at 1 gm. per pot [*cf. R.A.E.*, A **43** 180, etc.].

WEAVER (C. R.) & HAYNES (J. L.). **Band Placement of Insecticides for Clover Root Borer Control.**—*J. econ. Ent.* **48** no. 2 pp. 190–191, 3 refs. Menasha, Wis., 1955.

Hylastes (*Hylastinus*) *obscurus* (Marsham) is an important pest of red clover in Ohio, and as spraying and dusting against it are expensive and give inconsistent results, experiments were carried out on the effectiveness of insecticides applied with the fertiliser in a band along which the seeds are sown. In May 1951, 2 lb. γ BHC or 0·25, 0·75 or 1·5 lb. aldrin per acre was applied in this way, and the results were assessed in 1952. These showed that all treatments reduced damage to the roots by *Hylastes* and increased the second hay crop; in addition, BHC also controlled spittlebugs [*Philaenus leucophthalmus* (L.)] on the stems and increased the first crop.

In similar tests in 1952, aldrin was applied at 0·25 and 0·75 lb. per acre in May and γ BHC at the same rates in late June. In 1953, there were no differences in yield at the first cutting, but the two aldrin treatments reduced infestation of the roots from 96 to 5 and 0 per cent. and increased the yield at the second cutting from 1,940 to 2,680 and 2,620 lb. per acre, respectively, and the BHC treatments reduced root infestation from 96 to 31 and 7 per cent. and increased the yield from 2,040 to 2,180 and 2,740 lb. per acre, indicating that all treatments but 0·25 lb. γ BHC were highly effective. All treated plants showed substantially better recovery after the second cutting than untreated ones.

DEEN (O. T.) & CUTHBERT jr. (F. P.). **The Distribution and relative Abundance of Wireworms in Potato-growing Areas of the southeastern States.**—*J. econ. Ent.* **48** no. 2 pp. 191–193, 5 refs. Menasha. Wis., 1955.

Wireworms are serious pests of many crops in the south-eastern United States, and surveys of their economic importance and distribution in the coastal area, with particular reference to potato, were begun in 1952. *Conoderus vagus* (Cand.) was found to be the most abundant, constituting 84–86 per cent. of the adults either reared from wireworms collected in potato fields or found in or near the fields and some 92 per cent. of those taken at light near Charleston, South Carolina, and it was present in the coastal regions of North and South Carolina, Georgia, north-eastern Florida and Alabama [*cf. R.A.E.*, A **42** 310]. Adults were collected in Mississippi in 1930 and in Louisiana in 1934 and 1954. The Gulf wireworm, *C. amplicollis* (Gylh.), for which the name *Heteroderes laurentii* (Guér.) was formerly used [*cf.* **24** 522], comprised 3 per cent. of the larvae and 14 per cent. of the adults collected in potato fields near Charleston in 1952–54, and it was taken in South Carolina, Georgia, Florida, Alabama and south-eastern North Carolina. In general, it was more abundant than *C. vagus* in the interior and less so in the coastal areas. Adults of *C. rudis* Brown were taken in coastal areas of Alabama and in Mississippi and Louisiana; its economic importance and distinguishing larval characters are unknown. *Glyphonyx bimarginatus* Schaeffer was reared from larvae taken on potato in Louisiana, South Carolina, North Carolina and Georgia, but not in sufficient numbers to be considered a major pest. *C. vespertinus* (F.) was found in all the areas surveyed and was most abundant where tobacco or maize were the main crops. *C. lividus* (Deg.), *C. bellus* (Say) and *Colaulon rectangularis*

(Say) were also widespread, but apparently caused little injury to vegetable crops, and adults of 15 other species were taken at light, at Charleston.

Apple (J. W.) & Martin (R.). **Pea Aphid Control with Demeton in Relation to Pea Plant Maturity.**—*J. econ. Ent.* **48** no. 2 pp. 193–195, 7 refs. Menasha, Wis., 1955.

The authors describe spray experiments made in Wisconsin in 1953 to determine whether adequate control of *Macrosiphum pisum* (Harris) on peas could be obtained with dosages of demeton (diethyl 2-(ethylmercapto)ethyl thiophosphate) that decreased as the crop matured, so that the likelihood of excessive residues at harvest would be reduced. Peas were sown on 9th and 23rd May and 2nd and 14th June, and the plants were sprayed on 2nd July, when the oldest had small pods, the next were at first bloom, the next had ten nodes and the youngest had three nodes, with 1, 2, 4 or 8 oz. actual demeton from an emulsion concentrate (Systox) in 25 U.S. gals. spray per acre, respectively. A standard spray giving 4 oz. parathion per acre was used on plants having ten nodes, and some plants of each age were left untreated. The four dosages of demeton reduced Aphid populations by 92·5, 98·6, 100 and 100 per cent. in three days; plants treated with the first three contained 4·2, 11·5 and 21·5 parts demeton per million after three hours, those receiving the highest dosage being too small to analyse. Only half the original amount of toxicant was found in the plants 5–7 days after treatment, and Aphid populations were increasing on plants treated with 1, 2, 4 and 8 oz. demeton 8, 10, 18 and 18 days after treatment, respectively, when they all contained about 2 p.p.m. demeton, so that young plants treated more than three weeks before harvest might require retreatment if Aphid influx were heavy. Peas from all treated plants contained traces of demeton (less than 0·3 p.p.m.) after canning or freezing. Parathion was about as effective as an equal amount of demeton.

Pond (D. D.). **Insecticides against the Corn Earworm in New Brunswick.** —*J. econ. Ent.* **48** no. 2 pp. 198–199, 2 refs. Menasha, Wis., 1955.

Heliothis zea (Boddie) (*armigera*, auct.) is an occasional pest of late maize in New Brunswick, but early sweet maize was not attacked until 1947, when the loss of marketable ears was 55–90 per cent. In that year, injections of mineral oil into the ears of mid-season maize on 14th August and applications of 3, 5, 10 and 20 per cent. DDT dusts on 14th and 18th August resulted in 98, 77, 92, 96 and 83 per cent. uninjured ears, as compared with 45 per cent. on untreated plants. In 1948, when dusts were applied at 40 lb. and sprays at 100 gals. per acre on 16th and 24th August, 5 per cent. DDT dust and 3 per cent. DDD dust resulted in 92·5 and 85·8 per cent. uninjured ears and were significantly better than 0·2 lb. rotenone per acre in spray or dust or no treatment, which resulted in 32–57·2 per cent. uninjured ears; dusts of 40 per cent. ryania or 5 per cent. chlordane and sprays containing 1 lb. wettable DDT, DDD or chlordane or 4 lb. ryania per acre were intermediate in effect. In 1951, dusts containing 3 per cent. DDD or DDT, 40 per cent. ryania or 15 per cent. ryania with a synergist, applied on 15th August, resulted in 88·7, 23·7, 17·9 and 7·2 per cent. uninjured ears, as compared with 4·3 per cent. for no treatment, but in 1952, when infestation was severe and the same dusts were applied at 40 lb. per acre on 20th August (when the eggs were first observed) and again on 29th August, no treatment gave economic control.

HAWKINS (J. H.). **Preliminary Experiments in Corn Earworm Control.** —*J. econ. Ent.* **48** no. 2 pp. 199–201, 3 refs. Menasha, Wis., 1955.

In preliminary investigations on the control of *Heliothis zea* (Boddie) (*armigera*, auct.) on sweet maize in south-western Maine in 1954, 2 lb. actual DDT in wettable powder or emulsion concentrate, the latter alone or with 2·5 U.S. gals. white mineral oil (viscosity 60–90), and 1·5 U.S. quarts of a mixture of piperonyl butoxide and pyrethrins (10:1) were each applied in 150 U.S. gals. spray per acre. In one half of the experimental field, eggs were found on 16th August, when approximately 10 per cent. of the ears were in silk, and three applications of each spray at three-day intervals from 17th August caused significant reductions in the numbers of larvae per plot, which averaged 255 for no treatment; there was no significant difference between the numbers on plots treated with DDT (16–19), but significantly fewer in these than in plots sprayed with piperonyl butoxide and pyrethrins (66). In the other half of the field, in which a different variety of maize was sown, three applications of wettable DDT on 24th, 27th and 30th August reduced the number per plot from 59 (for no treatment) to 23 and three of the DDT emulsion spray, with and without mineral oil, reduced it to 6–9, the differences being significant and indicating that wettable DDT may be less dependable than an emulsion spray. There was no spray injury to the plants.

DDT is commonly applied to maize in late July or early August for the control of the European corn borer [*Pyrausta nubilalis* (Hb.)], and examination of ears sprayed with 2 lb. wettable DDT per acre against this insect in 1953 showed that there were twice as many larvae of *H. zea* on treated as on untreated plots and 7·5 times as many *Pyrausta* larvae on untreated as on treated ones. In tests in 1954, there were significantly more larvae of *Hcliothis* (186 and 131) and significantly fewer of *Pyrausta* (9 and 17) on plots treated with DDT in emulsion and wettable powder, respectively, in late July and early August than on untreated ones (118 of *Heliothis* and 31 of *Pyrausta*). If this tendency is confirmed in further tests, it will be necessary to weigh the risk of injury by *P. nubilalis* against that of possible increases in the *Heliothis* population.

MEDLER (J. T.). **Method of predicting the hatching Date of the Meadow Spittlebug.**—*J. econ. Ent.* **48** no. 2 pp. 204–205, 4 refs. Menasha, Wis., 1955.

The following is based on the author's summary. Investigations carried out over six years in Wisconsin on the prediction of the date of hatching of the eggs of *Philaenus leucophthalmus* (L.) indicated that this would occur within a week of the accumulation of a total of 150 day-degrees F. between daily mean temperatures of 40 and 50°F. The accuracy of the method suffices for planning applications of residual insecticides prior to hatching.

VERMA (J. S.). **Comparative Toxicity of some Insecticides to *Peregrinus maidis* (Ashm.) and its Egg-predator.**—*J. econ. Ent.* **48** no. 2 pp. 205–206, 4 refs. Menasha, Wis., 1955.

The Mirid, *Cyrtorhinus mundulus* (Bredd.), is an egg predator of importance in Hawaii, where it keeps the numbers of *Perkinsiella saccharicida* Kirk. on sugar-cane below the economic threshold and checks the growth of populations of *Peregrinus maidis* (Ashm.) in the later stages of maize growth. However, it fails to give commercial control of *P. maidis* on maize, which must, therefore, be treated with insecticides, and laboratory

studies were carried out to determine the comparative toxicity of p,p'DDT, lindane [almost pure γ BHC] and technical parathion and chlordane to this pest and the predator. The insecticides were applied in emulsion form as mists, to which insects that had been anaesthetised with carbon dioxide were exposed for two minutes. Mortality counts were made 24 hours later, and median lethal concentrations determined. These showed that parathion was the most toxic to *P. maidis* and BHC to *C. mundulus*, DDT and chlordane being the least toxic to both. The two sexes of the macropterous form of *P. maidis* did not differ significantly in susceptibility except to parathion, to which the male was the more susceptible, but the brachypterous males were less susceptible than the brachypterous females to DDT and more susceptible to the other materials. The brachypterous males were more susceptible than the macropterous males to all materials and the brachypterous females more susceptible than the macropterous females to chlordane but not to the others. The males of *C. mundulus* were more susceptible than the females or fifth-instar nymphs to every insecticide used, and all insecticides were more toxic to the predator than to the pest.

EIDE (P. M.). **Soil Treatments for *Brachyrhinus* Control in Strawberries.** —*J. econ. Ent.* **48** no. 2 pp. 207–208, 1 ref. Menasha, Wis., 1955.

Otiorrhynchus (*Brachyrrhinus*) *ovatus* (L.) and *O.* (*B.*) *sulcatus* (F.) are among the most important insect pests of strawberry in the north-western counties of Washington, and investigations on the control of the larvae in the soil were begun in 1950. The insecticides were applied in bands 18 ins. wide with a fertiliser spreader and mixed with the soil to a depth of 3–4 ins. with a rotary tiller, and the plants were set out down the middle of the treated strips. A natural infestation of *O. sulcatus* destroyed most of the plants in the untreated plots in one experiment in 1950, and it was found that aldrin and dieldrin gave good control at 5 and 10 lb. and chlordane at 10 and 20 lb. per acre, whereas BHC and lindane [almost pure γ BHC] were ineffective at 4 lb. γ isomer per acre. In other tests, plots treated before planting in 1950 and 1952 were artificially infested with eggs of the two weevils in the autumn of 1953, and larval counts made in 1954. Aldrin and dieldrin applied in 1950 at 5 and 7·5 lb. per acre and chlordane applied at 15 lb. gave good control of *O. ovatus*, and aldrin or dieldrin applied at 7·5 lb. in 1950 and aldrin, dieldrin and heptachlor at 3·5 and 5 lb. per acre in 1952 gave good control of *O. sulcatus*. Toxaphene, BHC, DDT and methoxy-DDT (methoxychlor) gave no control. Flavour was not affected.

SMITH (F. F.), GIANG (P.) & TAYLOR (E. A.). **Reduction of Malathion Residues on Vegetables by Washing.**—*J. econ. Ent.* **48** no. 2 pp. 209–210, 3 refs. Menasha, Wis., 1955.

In experiments in 1954, several common vegetables were treated when ready for harvesting with 1·75 lb. malathion per acre, applied in 44 lb. dust or 100 U.S. gals. wettable-powder or emulsion spray, harvested when dry and analysed immediately or after washing in tap water for 30 seconds and draining, either once or twice. Unwashed leafy vegetables, comprising beet tops, broccoli, kale and lettuce, generally showed higher malathion residues (2·6–19·71 parts per million) than snap beans, beetroots, okra pods [*Hibiscus esculentus*] or tomato fruits (0·15–8·63 p.p.m.), and the residues were usually lowest from the dust and highest from the wettable-powder spray. Washing reduced the residues from the dust to lower levels than those from the sprays. Two washings reduced the residues to less than

1 p.p.m. on all vegetables but lettuce treated with the wettable-powder spray and broccoli receiving either spray, and one reduced all residues on beans, okra and tomato below 1 p.p.m. On lettuce, residues from the dust were not reduced below 1 p.p.m. by washing once one hour after treatment, but were reduced when washed 24 hours after. When broccoli sprayed with an emulsion to give 1·25 lb. malathion per acre and found to contain 10·4–13·2 p.p.m. one hour after treatment was subjected to the regular washing and blanching with steam or hot water in preparation for freezing, the residue was reduced to 0·3–0·66 p.p.m. Unwashed samples that had been exposed to 0·3 inch rain and harvested 24 and 48 hours after treatment bore 1·26 and 0·48 p.p.m., respectively. It is concluded that malathion residues can be reduced to low levels by the usual washing methods.

Burchfield (H. P.) & Hartzell (A.). **A new Bioassay Method for Evaluation of Insecticide Residues.**—*J. econ. Ent.* **48** no. 2 pp. 210–214, 2 figs., 24 refs. Menasha, Wis., 1955.

An account is given of a recently described method for the bioassay of insecticide residues based on the response to light of the larvae of a mosquito (*Aëdes aegypti* (L.)) placed in aqueous dilutions of extracts of the materials to be assayed [*R.A.E.*, A **42** 76]. The larvae are reared under standardised conditions [*cf.* **42** 264], and the time required for 50 per cent. of them to become immobilised (T50) is used as the criterion of evaluation. The method has been used for estimation of the common synthetic organic insecticides in extracts of a variety of raw and processed vegetables [*cf.* **42** 376], and tests with the more important organic insecticides used in agriculture showed that all had T50 values of an hour or less at concentrations of 1 part per million and most of them at 0·1 p.p.m. [*cf.* **43** 36]. Mixtures of insecticides cannot be evaluated without some knowledge of the components [*cf.* **43** 119].

Some materials, such as nicotine, sodium arsenate and sodium cyanide, inactivate the larvae too slowly at 1 p.p.m. to make the test effective, but apart from certain acaricides, rotenone is the only important liposoluble material to which the larvae do not respond sufficiently. The fact that many general metabolic poisons do not produce a rapid response greatly reduces the possibility that observed toxicity may be due to naturally occurring plant products, with some obvious exceptions, such as the pyrethrins. However, the presence of lipids in the extracts tends to mask toxicity, and these should be removed if possible [*cf.* **42** 265, 376].

The advantages of the method, which provides a useful supplement to established methods of chemical analysis, particularly when the nature and amount of insecticidal residue are unknown, are discussed.

Yerington (A. P.) & Gertler (S. I.). **Acaricidal Properties of 2-Cyclohexyl-4,6-dinitrophenyl and Pentachlorophenyl Acetates.**—*J. econ. Ent.* **48** no. 2 p. 215, 1 ref. Menasha, Wis., 1955.

Pentachlorophenyl acetate, 4,6-dinitro-2-cyclohexylphenyl acetate [dinex (acetic acid)], parathion and Aramite [2-chloroethyl 2-(p-tert.-butylphenoxy)-1-methylethyl sulphite] were compared in sprays applied in a Potter tower [*R.A.E.*, A **40** 185] for the control of eggs and adults of *Tetranychus telarius* (L.) (*bimaculatus* Harvey) on leaves of castor [*Ricinus communis*] and of *Metatetranychus citri* (McG.) on orange fruits. Mortality counts of eggs after 4–5 days and of adults after two showed that the median lethal concentrations of the four compounds in mg. per litre were 1,200, 106, 265

and 1,100, respectively, for the eggs and 225, 27, 12·5 and 112 for the adults of *T. telarius*, and 50, 8·8, 3·8 and 26 for the adults of *M. citri*. All were relatively ineffective against the eggs of *M. citri*, preliminary non-replicated tests indicating that 0·5 per cent. parathion and 0·25 per cent. dinitrocyclohexylphenyl acetate would be necessary to produce 50 per cent. mortality. The latter in a 1 per cent. spray caused no injury to plants grown under natural conditions, whereas pentachlorophenyl acetate caused moderate injury to beet, peas and barley, severe injury to chard and slight damage to collards.

Cressman (A. W.). **Effect of Oil and Parathion Sprays on soluble Solids of Oranges.**—*J. econ. Ent.* **48** no. 2 pp. 216–217, 5 refs. Menasha, Wis., 1955.

In experiments in 1949–52 to find a safer oil for combination with wettable parathion for the control of *Aonidiella aurantii* (Mask.) on *Citrus* in California [*cf. R.A.E.*, A **39** 165], a special light petroleum fraction, with a viscosity of 50–52 secs. Saybolt, 91–92 per cent. unsulphonatable residue and a boiling range lower than any light oil registered for use in California, was found to be as effective as light-medium to heavy-medium oils with parathion, and fruits from sprayed groves were therefore analysed to determine the effect of this and other oils and parathion on the content of soluble solids and acids. The oils were applied at concentrations of 1–1·8 per cent., and 25 per cent. wettable parathion at 0·5–1 lb. per 100 U.S. gals. with oil and at 1·5–2 lb. per 100 U.S. gals. alone.

In nine groves of Valencia and one of navel oranges, sprayed in October–December or March, there were no differences in the content of soluble solids in fruits treated with medium oil, with or without parathion, in fruits treated with 1 per cent. and 1·5–1·75 per cent. medium oil, or in fruits treated with 0·5 and 1 lb. parathion per 100 U.S. gals. with oil. Fruits left untreated or treated with parathion only or special light oil averaged 0·6 per cent. more soluble solids than those treated with medium oil, and those untreated or treated with parathion only, 0·1 per cent. more than those treated with the special light oil. The latter with parathion did not cause any significant reduction in solids. When Valencia oranges were sprayed in September with special light, light-medium and medium oils, there was no difference in the content of soluble solids in the fruits.

Liles (J. N.) & Fisk (F. W.). **Toxicity of several Antibiotics administered by Injection to the German Cockroach.**—*J. econ. Ent.* **48** no. 2 p. 217, 3 refs. Menasha, Wis., 1955.

Various antibiotics injected into adults of *Blattella germanica* (L.) showed considerable differences in toxicity. The most toxic was polymixin with median lethal doses in μg. per cockroach of 11 for males and 23 for females, and the least toxic was a penicillin [*cf. R.A.E.*, A **42** 82].

Gast (R. T.) & Brann (J. L.). **A Laboratory Dust Mixer.**—*J. econ. Ent.* **48** no. 2 pp. 217–219, 2 figs., 1 ref. Menasha, Wis., 1955.

A mixer was devised for the laboratory formulation of small quantities of insecticidal dusts without grinding. It consisted essentially of a metal cone to hold the dust, a motor-driven blade-bearing shaft for agitation, and a

spray injector to discharge the toxicant as a mist on to the agitated dust, and its construction and use are described in detail. Liquid toxicants, such as parathion or nicotine, can be used directly in the injector, but solids such as DDT are first dissolved in a solvent, which should be capable of dissolving at least 50 per cent. of its weight of insecticide and should not be excessively volatile, since too rapid evaporation leaves deposits of insecticide on the injector; cyclohexanone was found to be better than acetone or ether for DDT. For the best results, the dust should not become saturated with the solvent. After impregnation, the dust should be spread on a glass plate to permit evaporation of the solvent and then poured slowly into the running mixer to break up any caked material.

Parathion was formulated as a 15 per cent. dust with 28 different carriers, of which gypsum proved to be the most difficult to mix evenly. However, 14·4–14·82 per cent. parathion was recovered from 11 samples prepared with gypsum, and 14·13–14·63 per cent. DDT from 15 per cent. formulations in the same carrier, and the mixing was adequate, since the variations were well below measurable differences obtained in biological tests.

Barnes (M. M.) & Ash (C. R.). **Ovicidal Action of Malathion on Grape Leafhopper Eggs.**—*J. econ. Ent.* **48** no. 2 pp. 220–221, 2 refs. Menasha, Wis., 1955.

Vines in California are commonly dusted with 4 per cent. malathion at 20 lb. per acre against leafhoppers, and almost complete mortality of nymphs and adults is obtained, except in cool weather. Effectiveness is considerably prolonged in warm weather, and as this seemed unlikely to be due to residual action against nymphs hatching after treatment, the incubation period lasting 14–20 days at a mean temperature of 77°F., the possibility of ovicidal action was investigated. Adults of *Erythroneura variabilis* Beamer were allowed to oviposit for five days on vines with seven leaves, during which they laid an average of 67 eggs per leaf, and they were then removed and the plants dusted uniformly on both sides of the leaves with 4 per cent. malathion. Treated and untreated plants were kept at an average temperature of 77°F., and when hatching began on the untreated plants, one of these was also dusted, to see whether the insecticidal effect would be influenced by the age of the eggs. Newly hatched nymphs were counted and removed each day, and the number and state of the eggs in three leaves from each plant were determined when hatching was complete. Less than 0·5 per cent. of the eggs in the leaves dusted with malathion hatched, as compared with an average of 84 per cent. of those in untreated foliage. Half the eggs in the leaves dusted soon after the removal of the adults showed some development, and 85 per cent. of those in the leaves treated when hatching began showed well developed embryos, though virtually all had failed to hatch. It is concluded that malathion has some ovicidal effect.

Beckel (W. E.). **Lindane applied in liquid Floor Wax for Control of Silverfish (Thysanura).**—*J. econ. Ent.* **48** no. 2 p. 221. Menasha, Wis., 1955.

In a test on the control of silverfish [*Lepisma saccharina* L.] in Manitoba, tiles were waxed and polished once with a mixture of 1 per cent. lindane [almost pure γ BHC] in oil and liquid floor wax or with 1 per cent. lindane wettable powder in liquid floor wax and ten silverfish were exposed on them at intervals for a fortnight to determine the time required for total mortality. There were no differences between lindane in oil or wettable powder in the

time required for complete kill, which increased from 25 minutes 1–3 days after treatment to 30 minutes after 5–8 days and 90 minutes after 11–14 days. Tiles that were treated daily with the mixtures showed no less shine than normally polished floors; the wettable powder caused no odour, but BHC in oil caused one that might be considered objectionable. Further tests indicated that a freshly treated floor would kill silverfish if they remained on it for 2–5 minutes before moving to an untreated area. The low BHC concentration was chosen to minimise the possibility of harm to children, but a higher one might be equally safe and more rapid in effect.

Butler jr. (G. D.). **The Effect of Alfalfa Irrigation Treatments on the Two-spotted Spider Mite in Alfalfa.**—*J. econ. Ent.* **48** no. 2 pp. 221–222, 1 fig. Menasha, Wis., 1955.

Preliminary observations in Arizona in 1951 showed wide variations in populations of *Tetranychus telarius* (L.) (*bimaculatus* Harvey) on plots of lucerne that received different amounts of moisture, and the effect of irrigation frequency was therefore investigated in 1952. All plots were thoroughly irrigated on 28th March, after which one series received no further irrigation and others were irrigated at intervals of three weeks and ten days, respectively. By 20th May, when the lucerne was cut, there were no marked growth differences between the plants receiving the different treatments and no important mite populations had developed, but the regrowth showed marked differences, the plants being much larger on the wet and much smaller on the dry plots than on the medium ones, and the numbers of mites on the large basal leaves on 100 main stems were 0–10 on the dry, 37–304 on the medium and 84–1,024 on the wet plots between 24th June and 15th July. The effect of irrigation on the mite is believed to be both ecological and nutritional. The sparse growth on the dry plots allowed the sunlight to penetrate to the soil surface and so resulted in high air temperatures and low relative humidities a few inches above the ground, and the differences in the condition of the plants, varying from the hardened, sparse growth of the dry plots to the lush growth of the wet ones, probably affected the availability or quantity of nutriment for the mites and thus caused correspondingly marked variations in population.

Hutchinson (M. T.). **Systox for Control of the Leafhopper Vector of Cranberry False-blossom.**—*J. econ. Ent.* **48** no. 2 pp. 222–223, 2 refs. Menasha, Wis., 1955.

Investigations were made in New Jersey in 1954 to ascertain whether demeton [diethyl 2-(ethylmercapto)ethyl thiophosphate] would control the Cicadellid, *Scleroracus vaccinii* (Van D.), which is the vector of the virus that causes false-blossom of cranberry [*cf. R.A.E.*, A **40** 225]. Eight infected plants in six-inch pots were treated with about 1 U.S. quart of an emulsion prepared by diluting a 23 per cent. concentrate (Systox) at the rate of 1·5–2 pints per 100 gals. water, this being applied to the soil in mid-April, and 600 leafhoppers that were allowed to feed on them from 7th July were all dead by 29th July, whereas those on untreated plants survived, indicating that the demeton was still effective after three months.

To determine whether the insecticide had persisted in the plants, in the soil or in both, the plants were separated from the treated soil, washed and repotted in untreated soil, while untreated plants were set in the treated soil. Mortality counts of leafhoppers allowed to feed on the plants showed that the treated ones were still highly toxic on 6th, 24th and 27th August and

that untreated plants in treated soil were highly toxic on the first date and progressively less so on the later ones.

If a demeton spray should prove as effective as soil treatment appears to be, it might be used to control the leafhopper on newly planted cranberry bogs during their first year. There would be little risk of toxic residues, since the fruit is not harvested until the third year, and other pests might also be reduced.

Hamilton (E. W.) & Hill (R. E.). **Garden Webworm Control on Corn.** —*J. econ. Ent.* **48** no. 2 p. 224, 2 refs. Menasha, Wis., 1955.

Loxostege similalis (Gn.) was unusually abundant in south-eastern Nebraska in the summer of 1954, causing serious damage to lucerne and also injuring maize and sorghum. Similar outbreaks had occurred in 1947 and 1949, since when infestation had been unimportant. In tests, toxaphene and DDD were applied to maize at 2 lb., endrin at 0·4 lb. and aldrin at 0·5 lb. in 60 U.S. gals. water per acre, on 3rd July, and population counts were made 25–30 hours later. The four treatments resulted in averages of 9·5, 7, 5 and 12·5 larvae per ten plants, respectively, as compared with 15·2 for no treatment. The least significant difference was 4·9, and endrin, although not significantly better than DDD or toxaphene, is recommended for control.

Burkhardt (C. C.) & Breithaupt (M. P.). **Chemical Control of the Corn Earworm in Sorghum Heads.**—*J. econ. Ent.* **48** no. 2 p. 225, 1 ref. Menasha, Wis., 1955.

In August 1954, many fields of sorghum in north-central Kansas had 40–60 per cent. of the heads infested by larvae of *Heliothis zea* (Boddie) (*armigera*, auct.). The numbers of larvae per head ranged up to 16, and examination of one head infested by 16 larvae showed that 25–30 per cent. of the kernels were damaged or destroyed. In tests on control, emulsion sprays were applied with a hand sprayer at the rate of 1 U.S. quart per 280 foot of row (46 U.S. gals. per acre), and examination of heads after 24 hours showed that the control percentages were 96 for 0·5 lb. OS-2046 (dimethyl 2-carbomethoxy-1-methylvinyl phosphate [also known as dimethyl 1-carbomethoxy-1-propen-2-yl phosphate]) per acre, 84 for 2·75 lb. DDT, 60–72 for 0·4 lb. endrin alone and in oil (at 0·4 lb. per U.S. gal.), 0·6 lb. endrin, 0·4 and 0·5 lb. lindane [almost pure γ BHC], 0·5 lb. parathion in oil (at 0·5 lb. per U.S. gal.) and 5 lb. toxaphene, 37 for 0·5 lb. OS-1808 (diethyl 2-carbethoxy-1-methylvinyl phosphate) and 41 for 1·25 lb. heptachlor. After 96 hours, the figures were 100 for OS-2046, 0·4 lb. endrin and 0·5 lb. lindane, 95 for DDT, 43 for OS-1808 and 85–90 for the other materials. Speed of action is desirable as two additional days of feeding greatly increased the damage. Oil did not appear to improve the penetration of endrin or parathion into the heads. It was not determined whether control by OS-2046 resulted from systemic action, direct contact or fumigation; it was accompanied by slight plant injury.

Pfadt (R. E.). **Control of Army Cutworms in Alfalfa.**—*J. econ. Ent.* **48** no. 2 p. 227, 2 refs. Menasha, Wis., 1955.

Lucerne in Wyoming is often infested in spring by *Chorizagrotis auxiliaris* (Grote), feeding by the overwintered larvae of which may delay the appearance of the young shoots above the ground litter for as much as six weeks

beyond the normal time. Tests of eight organic insecticides for control were made in May 1954 by applying sprays (all prepared from emulsion concentrates) at the rate of 15 U.S. gals. per acre with a power sprayer in April, when the plants were 0–1·5 ins. high and the larvae mainly in the fifth or sixth instar, and counting the numbers on sample areas 12–16 days later. Endrin, Dilan [a 1:2 mixture of 1,1-bis(p-chlorophenyl)-2-nitropropane and 1,1-bis(p-chlorophenyl)-2-nitrobutane], DDT and dieldrin, applied at 0·2, 0·25, 2 and 0·375 lb. actual toxicant per acre, respectively, were the most effective, giving 92, 86, 80 and 76 per cent. reduction in numbers over no treatment, whereas dieldrin, heptachlor, chlordane, toxaphene and aldrin at 0·25, 0·5, 2, 2 and 0·5 lb. per acre gave 47–23 per cent. reduction. Analysis of lucerne cut just before the harvesting of the first crop showed no endrin residue on plants treated with 0·2 or 0·3 lb. per acre in 1953 or with 0·2 lb. in 1954, the interval between treatment and cutting ranging from 55 to 80 days. The stronger dieldrin spray would be especially useful, as it also controls the lucerne weevil [*Hypera variabilis* (Hbst.)] [*cf. R.A.E.*, A **39** 263].

Silva (P.). **Um novo ácaro nocivo ao tomateiro na Bahia** (*Tetranychus marianae* **McGregor, 1950—Acarina).** [A new Mite injurious to Tomato in Bahia (*T. marianae*)].—*Bol. Inst. biol. Bahia* **1** no. 1 repr. 20 pp., 5 figs., 24 refs. Salvador, 1954. (With a Summary in English.)

The author gives a list of the mites known to attack crop plants in Bahia, Brazil, and states that in January 1952, *Tetranychus marianae* McG., which was described from the Mariana Islands [*cf. R.A.E.*, A **43** 161], was found infesting tomatos near the town of Salvador, in that State. It has since been observed there on wild species of *Solanum* and *Physalis*, and infested peppers (*Capsicum annuum*) in pots in the laboratory. It has not been previously recorded from Brazil but is believed to have been present there for some time. All stages are described. On tomato, light patches appeared on the leaves as a result of feeding, which occurs on the lower surfaces, and the lower leaves and buds dried up, causing the death of the plant. Symptoms usually appeared first on the lower leaves, and plants in the laboratory were killed in an average of 30 days. The wild food-plants survived attack. During rearing on leaves of tomato in the laboratory in May–June 1953, the life-cycle from egg to adult averaged 6·5–11·5 days. Development resembled that of other Tetranychids [*cf.* **43** 423; **44** 52], but no deutonymphal stage was observed in the males. The most important natural enemies observed were *Stethorus ogloblini* Nunenmacher and *Holobus* (*Somatium*) sp., which destroyed numerous eggs and mites. J. T. Fontes obtained good control in laboratory and field tests with a proprietary lime-sulphur product. It is recommended that wild plants likely to harbour the mite should be destroyed before tomatos are planted, and suggested that the physical effect of watering the plants with a power sprayer might result in control.

Rojas P. (S.). *Aphytis* **sp. X, enemigo natural de la conchuela morada de los** *Citrus*. [*Aphytis* sp. X, a natural Enemy of *Lepidosaphes beckii* on *Citrus*.]—*Agric. téc.* **14** no. 2 pp. 112–115, 8 figs., 3 refs. Santiago, Chile, 1954.

To initiate a campaign for the biological control of *Lepidosaphes beckii* (Newm.) on *Citrus* in Chile, an undescribed Aphelinid referred to as *Aphytis*

sp. X was introduced from California [whither it was stated in a paper already noticed (*R.A.E.*, A **38** 376) to have been imported from China] and reared on that Coccid on citron melon, *Colocynthis* (*Citrullus*) sp. in the laboratory. It is an ectoparasite and most frequently attacks the third-stage Coccids. The eggs are laid beneath the scale, and usually not more than two parasites complete their development on the same host. If gravid females do not find a suitable host within about seven days, there is a temporary loss of the ability to oviposit. The adult females feed on the body fluids of the Coccid, and if the numbers of the latter are low, they drastically reduce the food available for the development of the following generation. They usually survive for about 10–15 days (though they did so for 15–18 days in the insectary) and probably lay over 30 eggs each. At about 25°C. [77°F.] and 60 per cent. relative humidity, a generation was completed in about three weeks, and the adults were collected and forwarded in batches of 250–400, in tubes smeared with honey, to the areas in which they were to be released. Liberations were made in ten localities in central Chile in 1952–53, and the parasite was subsequently recovered in five of them, though parasitism in no case exceeded 10 per cent.

Ghosh (R.) & Newman (J. F.). **A new Group of Organophosphorus Pesticides.**—*Chem. & Ind.* 1955 no. 5 p. 118. London, 1955.

An account is given of methods by which O,O-diethyl S-2-diethylaminoethyl phosphorothiolate was prepared and of tests in Britain on the toxicity of this compound and of salts of it, of which the hydrogen oxalate was that chiefly used. Both the compound and its salts are highly effective and persistent as systemic toxicants against various species of Tetranychids.

In laboratory tests, a water solution containing 0·5 mg. of the compound applied to the soil in a 3-inch pot in which a french-bean plant was growing killed 50 per cent. of *Tetranychus telarius* (L.) in four days, and a single spray application at 80 parts per million on small bean plants continued to give complete mortality of adults placed on the plants for more than 18 days after treatment. Absorption by the leaves is rapid, and in tests with the oxalate, the toxicity of sprayed bean leaves to *T. telarius* could not be significantly reduced by washing with water later than one hour after application. In comparative tests with the compound or its salts against *T. telarius* and insects of various groups, the median lethal concentration in p.p.m. and (in brackets) the approximate toxicity relative to parathion similarly applied were 1 (7) for the oxalate applied as a contact spray against *T. telarius* on the food-plant, and the corresponding figures were 3 (2), 8,000 (0·1) and 800 (0·03) for contact sprays against *Macrosiphum pisum* (Harris) (*Acyrthosiphon pisi* (Kalt.)), *Tribolium castaneum* (Hbst.) and *Dysdercus fasciatus* Sign., respectively, and 8 (0·001) for fourth-instar larvae of a mosquito (*Aëdes aegypti* (L.)) kept in water solutions. A contact spray at 80 p.p.m. gave no kill of the Coccinellid, *Micraspis sexdecim-punctata* (L.). In an injection test, the median lethal dose for adults of *Locusta migratoria* (L.) was 10 μg. per locust, this being one-tenth the corresponding figure for parathion.

In field tests against *Metatetranychus ulmi* (Koch) on apple in 1953 and 1954, one application of the oxalate at 20 p.p.m. in June gave almost complete control throughout the season, and other compounds in the group gave good control when similarly applied at concentrations ranging from 5 to 80 p.p.m. These compounds are active inhibitors of mammalian acetylcholinesterase and need the same care in use as parathion.

GOŁĘBIOWSKA (Z.). **Szkodliwość źdźbłarza pszenicznego** (*Cephus pygmaeus* L.). [The Injuriousness of the Wheat Stem Sawfly (*C. pygmaeus*).] —*Roczn. Nauk roln.* **71** (A) pt. 2 pp. 249–283, 2 graphs, 1 map, 38 refs. Warsaw, 1955. (With Summaries in Russian and English.)

Cephus pygmaeus (L.) was abundant on cereals in the district of Pulawy (eastern Poland) in 1950 and to a less extent in 1951 and 1952, and since data on the extent of the damage caused by it in Poland are scarce, investigations were carried out. The crops most severely affected were winter rye and winter wheat. Estimates of the damage caused by the sawfly are complicated by the fact that the females normally select the most developed and productive main stems for oviposition, and the yield from these does not then differ much from that of the uninfested weaker stems, but the tillers are also attacked in years in which the flight period of the adults is protracted or the weather is so favourable that the tillers develop almost as well as the main stems. Investigations on wheat and rye in the three years showed that infestation had no effect on the length of the main stems, tillers or ears, the number of ears per plant or the number of grains per ear, but that it reduced the weight of the grains (as measured for lots of 1,000 grains) by 15–17 per cent. in 1950, 22–27 per cent. in 1951 and 7–9 per cent. in 1952. The percentage loss in weight of the grains can thus be taken as a coefficient of injury [*cf. R.A.E.*, A **14** 285; **19** 594]. In years in which the tillers and main stems are equally well developed, it should be derived from mixed grains taken from both of these, but in years in which the tillers are inferior, only grains from the main stems should be used. The coefficient of injury multiplied by the percentage of infested stems gives a reliable indication of total losses in the yield of grain, and these varied in the three years of the investigations from 0·5 to 5 per cent. In addition, indirect losses are caused by the habit of the larvae of cutting the stems at the base shortly before harvest, so that they are easily blown down by the wind or rain which causes shattering and impedes harvesting.

BERBEĆ (E.). **Pewne dane o śmietce burakowej**—*Pegomyia hyosciami* **Panz. i jej zwalczanie.** [Some Data on the Beet Fly *P. hyoscyami* and its Control.]—*Roczn. Nauk roln.* **71** (A) pt. 2 pp. 285–298, 10 refs. Warsaw, 1955. (With Summaries in Russian and English.)

In view of the damage caused to beet in Poland by *Pegomyia hyoscyami* (Panz.), investigations on the bionomics and control of this Anthomyiid were carried out in the Province of Poznan in 1950–52. There were three generations a year, and they overlapped owing to the protracted flight period of the adults. Emergence of the flies of the overwintered generation began at the end of April or the beginning of May and reached a peak in the first half of May, adults of the first generation were on the wing from about mid-June to mid-July, and those of the second were present at the end of August and in September. The first generation was the most injurious. The eggs were laid on the lower surface of the leaves of the young beet plants, mostly in places protected from wind and exposed to the sun, and the larvae hatched in 4–18 days, mined the leaves and pupated in the soil or occasionally on the plants themselves. Development from oviposition to adult emergence was completed in 5–8 weeks.

The control experiments were carried out on infested plants in plots, and proprietary preparations of unstated toxicant content were used. The results showed that dusts of DDT or BHC were less effective than emulsion sprays, and that treatment with the latter soon after the eggs are laid gives almost complete protection against the larvae, BHC being somewhat more effective than DDT.

PALLADINI (G.) & MARTELLI (G. P.). **Prime prove di disinfestazione nel vuoto eseguite in Abruzzo con apparecchio mobile.** [First Tests of Vacuum Disinfestation made in Abruzzo with a mobile Apparatus.]—*Ann. Sper. agr.* (N.S.) **9** no. 6 suppl. pp. xcv–cv, 3 figs. Rome, 1955. (With a Summary in English.)

The authors describe a mobile apparatus, consisting of a steel chamber with a capacity of nearly 180 cu. ft. and mounted on the chassis of a lorry, that was developed in Italy for the vacuum fumigation of agricultural products and plants, and give an account of tests carried out with it at temperatures of 26–29°C. [78·8–84·2°F.] in July 1954. The vacuum was varied according to the produce to be treated, and the reductions in pressure are given in mm. mercury. The fumigant used was methyl bromide.

In the first test, carob beans [*Ceratonia siliqua*] infested by larvae of *Plodia interpunctella* (Hb.) and *Ephestia* sp., in baskets each containing about 44 lb., were fumigated for 90 minutes at 80 oz. per 1,000 cu. ft., the reduction in pressure being 380 mm. Two paper bags, each containing about 2 lb. wheat infested by *Calandra granaria* (L.), were tightly enclosed in cellophane and also placed in the chamber. No dead insects were found when the chamber was opened, but the larvae of *Plodia* and *Ephestia* and the *Calandra* weevils died within the next 45 minutes.

In a second test, two sacks of barley severely infested by *C. granaria* and one of chick peas [*Cicer arietinum*] lightly infested by *Bruchus* (*Laria*) sp. were fumigated at 100 oz. per 1,000 cu. ft. for 90 minutes, the reduction in pressure being 650 mm. A daisy plant (*Chrysanthemum leucanthemum*) in a pot and an ornamental cactus (*Opuntia microdasys*), the latter severely infested by a Coccid thought to be *Diaspis echinocacti* (Bch.), were also placed in the chamber. All the insects were alive at the end of the exposure, but mortality of *Calandra* and *Bruchus* began after a few hours and there was 96 per cent. mortality of the Coccid in 25 days. The youngest leaves of the daisy plant and the young leaf-pads of the cactus dried up, but there was no further damage to the plants. Similar results were obtained when wheat and barley infested by *C. granaria* and peas infested by young larvae of *B.* (*L.*) *pisorum* (L.) were fumigated for 105 minutes at 80 oz. per 1,000 cu. ft., with a reduction in pressure of 380 mm.

In a test with fresh fruits, plums and pears infested by *Cydia pomonella* (L.) were fumigated for 90 minutes at 40 oz. per 1,000 cu. ft., with a reduction in pressure of 166 mm. All the larvae in the pears and 85 per cent. of those in the plums died as a result of the treatment, but some larvae survived in plums in which the holes were blocked with gum. Nearly five tons of plums, sorted and packed in boxes for export, were subsequently treated in the same way, and one box of plums heavily infested by *C. pomonella* was included. The export consignment arrived at its destination in perfect condition four days later. Examination of the infested plums 24 hours after treatment showed that about 20 per cent. of the larvae, all in holes blocked with gum, were still living. Fumigation caused no injury to the fruits, and those that were not infested ripened normally.

BALCELLS R. (E.). **Estudio ecológico de los crisomélidos del aliso.** [An ecological Study of the Alder Beetles.]—*Publ. Inst. Biol. apl.* **20** pp. 47–61, 13 refs. Barcelona, 1955. (With a Summary in English.)

A detailed account is given of observations on the life-cycle of the Chrysomelid, *Melasoma aeneum* (L.), and the Galerucid, *Agelastica alni* (L.), on alder (*Alnus*) in the field near Barcelona in 1947–54 and in the laboratory, with special reference to temperature, and their distribution is discussed in the light of the results. Both species have one generation a

year. The overwintered adults of *M. aeneum* appeared in the field in late April and early May, the females laid about 100 eggs each in batches of 24–27 on the leaves in mid-May, and development from egg to adult lasted about 26 days, pupation occurring on the trees. In the laboratory, at an average of 24°C. [75·2°F.], the egg, larval, prepupal and pupal stages lasted 4, 12·5, 1·5 and 4·3 days, respectively. The overwintered adults of *A. alni* appeared in mid-March, and the females oviposited in early April, adults of the next generation emerging in mid-July. In the laboratory, at an average of 21°C. [69·8°F.], a maximum of 615 eggs was laid per female, and the egg, larval, prepupal and pupal stages averaged 10–12, 32, 5·5 and 12 days, respectively. Pupation occurred in the soil.

SWAINE (G.). **Underground Storage of Maize in Tanganyika.**—*E. Afr. agric. J.* **20** no. 2 pp. 122–128, 7 figs., 6 refs. Nairobi, 1954.

In view of the good results obtained in Argentina by storing grain in hermetically sealed pits [*cf. R.A.E.*, A **41** 380], tests were made of this method for the long-term storage of maize in Tanganyika in 1951–53. Three pits, each with a capacity of about 120 tons, were constructed according to specifications based on the Argentine work, at Morogoro, Dodoma and Moshi, respectively. The pits were lined with reinforced concrete and faced with plaster treated with one of two waterproofing compounds, and they were filled with infested maize and covered with two layers of rubberoid sheeting with a layer of chicken wire between, the whole being sealed with bitumen. The rubberoid top was given a coat of white paint at Morogoro, left untreated at Dodoma and covered with bitumen at Moshi. At intervals after sealing, the grain was sampled at various depths by means of a sampling spear, its temperature and moisture content were recorded, and the carbon-dioxide content of the air in the intergranular spaces was determined [*cf.* **32** 435]. The pits were finally opened 379, 446 and 466 days after sealing, respectively, and the condition of the grain assessed.

In the Morogoro pit, all examples of *Calandra oryzae* (L.) were dead within 31 days of sealing, a reasonably high concentration of carbon dioxide (5·91–10·17 per cent. of the intergranular air) was maintained throughout the storage period, and the grain was in excellent condition at the end of it. At Dodoma, living examples of *Calandra* were still present five months after sealing, and the rather low concentration of carbon dioxide throughout the period (1·07–5·68 per cent.) indicated that the pit was not sufficiently gas tight. It was concluded that the facing was defective, since no faults were found in the roofing material, and in fact, local damage to the grain had occurred at one end of the pit, evidently owing to water that had seeped through the wall, though there were no signs of a crack. At Moshi, the concentration of carbon dioxide reached a maximum of 10·25 per cent. on the second day after sealing, but after 99 days, when the last living *Calandra* was found in the grain samples, it had fallen to 3·54 per cent. A slight leak in the roof covering developed, probably at a late date, and a small amount of water entered locally. In general, the grain was in good condition at the end of storage, though small numbers of *Tribolium castaneum* (Hbst.) were still alive when the pit was opened.

The storage of grain in pits is shown to be cheaper than storage in godowns when structural costs are considered; it does not require the use of bags, and keeps the grain in better condition. In view of the losses of carbon dioxide in the pits at Dodoma and Moshi, in which a different waterproofing compound had been used from that at Morogoro, it is suggested that the bitumen waterproofing used in Argentina, or some other tested material, be used for future pits, and that alternative materials might be sought for the rubberoid sheeting, which developed a defect in one instance.